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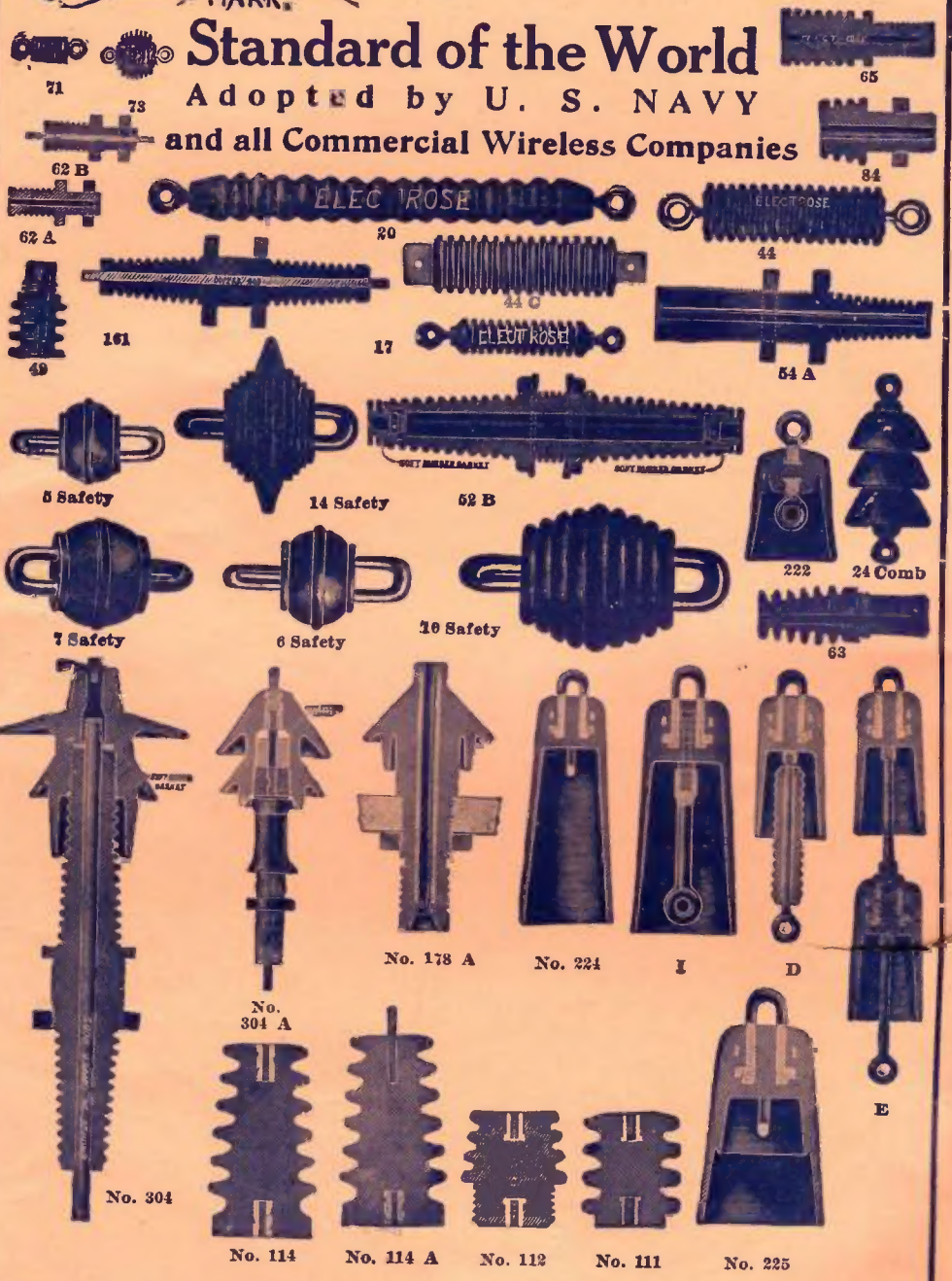

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Edited by H. Gernsback

Volume V | SEPTEMBER, 1912 | No. 6

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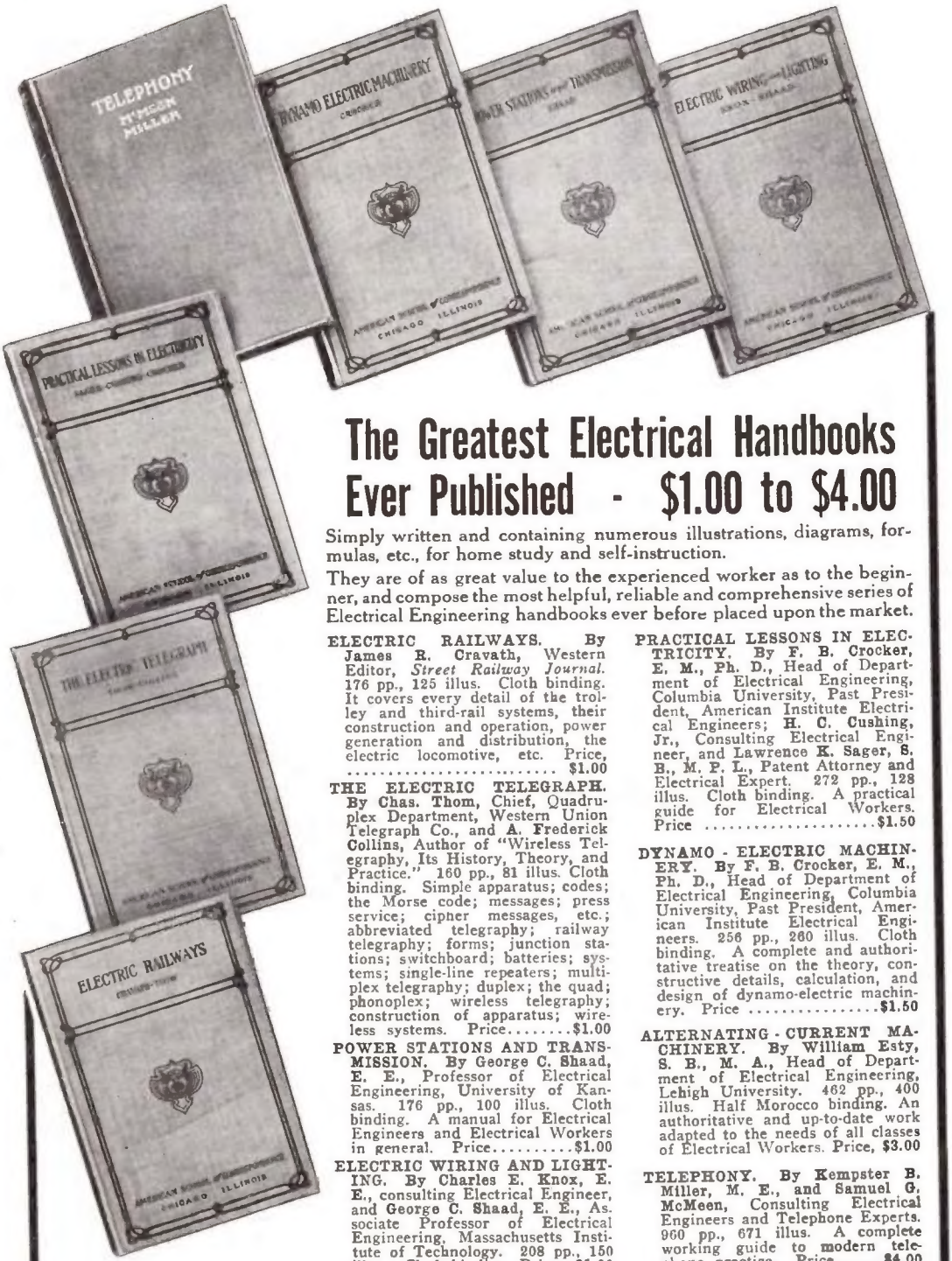

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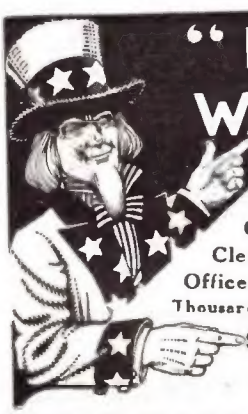

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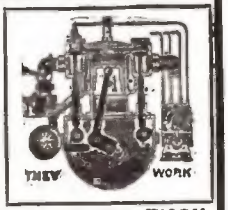

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CHAPTER IV

(Continued)

87. VOLTMETERS. REPULSION TYPE.

THIS instrument is shown clearly in Fig. 133. In the inside of the spool A, which is wound on a short brass or copper tube, two pieces of soft iron BB, are mounted, and the movable thin armature, L, is made to turn on its axis as shown. The current which circulates in the spool, A, magnetizes the pieces, BB, and the armature, L, so that all have North poles at one end of the spool, and South poles at the other end. The result is that the armature, L, is repelled by BB, and turns about its axis.

These instruments are made very often in the form of a watch and can, of course, be made in any desired size. In order that the hand, Z, can be adjusted to zero it is necessary that the instrument be in a vertical position, or else it is necessary to bring it to zero by means of a small spiral spring and an adjusting screw.

Fig. 134 shows another instrument of the repulsion type.

The core of the spool is a very thin soft iron ribbon, E, which is bent in, at B. The axis, A, carries a very thin soft iron armature of the same width as the ribbon, E. The hand, Z, can be brought back to zero by means of a fine hair spring and adjusting screw. The instrument may be used in any position.

88. GALVANOMETERS WITH MOVABLE COILS.

A wire loop which is suspended between the poles of a magnet tends to

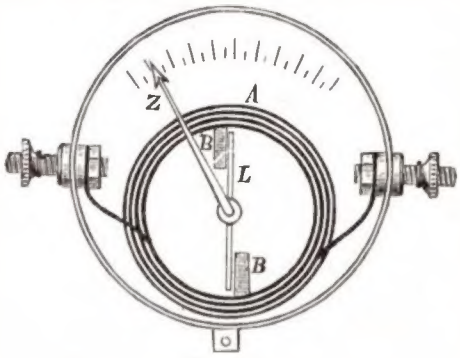


Fig. 133.

turn itself at right angles to the plane of the magnet when a current is sent through it. It is restrained in this motion by the twisting up of the suspending wires.

This principle is practically demonstrated in Fig. 135.

Between the two poles of the compound horse-shoe magnet, A, a very thin frame, C, having the shape of a rectangle is suspended. This frame, C, is wound with a very fine copper wire. It also carries the mirror, S, or else a pointer. The suspending wire which is clearly seen in the illustration is made of silver and is very fine. This wire at the same time is used to carry the current to the coil. A second such wire, or a small spiral, is attached at the bottom of the frame C, and goes to the spring, f. A small adjusting screw, in connection with the spring, f, can be used to regulate the tension of the wires. The magnetic effect is greatly strengthened by the soft iron tube, B, around which the frame, C, turns. The small frame itself is usually made of aluminum.

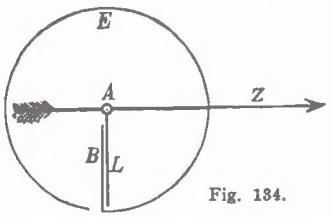


Fig. 134.

89. HOT WIRE INSTRUMENTS.

a. Wind a spiral of platinum wire, (No. 32 to No. 18, B. & S. gauge), of about three or four turns, and with an opening large enough that the spiral can be slipped over a thermometer bulb. This spiral is then placed in the circuit with a standard tangent galvanometer and rheostat, and the resulting current intensities are marked on the thermometer. When alternating current is used such a thermometer will always give the mean current intensities, but it takes a long time to come up to its full value.

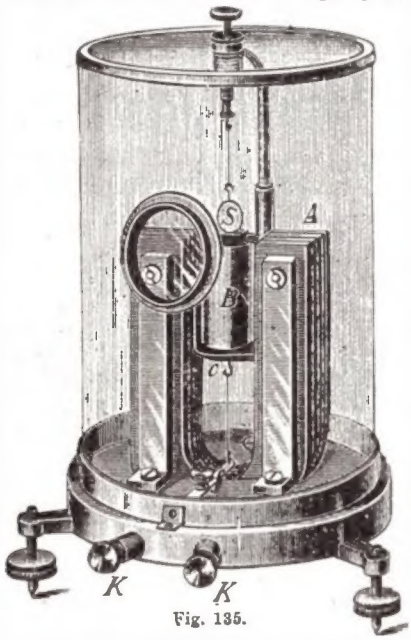


Fig. 135.

b. In Fig. 136 we have a platinum-silver wire, d, No. 43 B. & S., about 6.3 inches long, having a resistance of about 14.5 Ohms. This wire is fastened rigidly at its two ends, and the small adjusting screw, s, is used to give more or less tension to the wire, d. About in the center of the wire is fastened a brass wire, m, No. 44, B. & S., and about 4 inches long, the other end being fastened rigidly. From the center of this wire, a cocoon thread is passed around a small pulley and connected to a sensitive spring, p, which keeps the wires always in tension. When the current passes through, d, the latter heats up and becomes longer. The small pulley, whose axis is mounted in bearings of glass or some precious stone, therefore turns, carrying with it the pointer. These instruments can be used for direct and alternating currents.

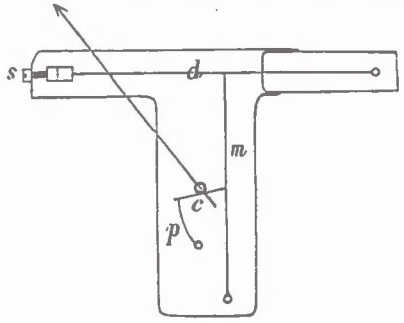


Fig. 136.

When used as an ammeter, d is in shunt, while the voltmeters have a very high multiplying resistance.

An equally good arrangement is shown in Fig. 137.

AB and CD are two parallel wires and are usually in a vertical plane. The current traverses these wires either in series or in parallel, as desired, and they are bent out of their parallel lines by means of the fine silk thread, a, c, b, as soon as they are heated, which lengthens them.

At c, another silk thread is attached, which runs over the pulley, r, which latter is connected rigidly with the small mirror, s. The spiral spring, f, keeps

the silk thread in tension. The mirror can, of course, be replaced by a light hand.

90 CURRENT REVERSERS AND THEIR CONSTRUCTION

It is almost impossible, when using galvanometers, to set the magnetic needle in such a manner that it lies absolutely in the North-South direction. There will always be more or less error in the readings, but these faulty readings can be rectified by reversing the direction of the current. This will give readings on both sides of the zero, and if the mean of the two is taken, a very accurate net reading is had.

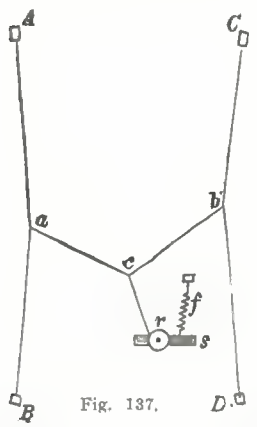


Fig. 137.

Apparatus which reverse the direction of the current quickly are termed current reversers, commutators, gyrotropes and inverters.

Fig. 138.

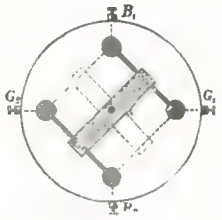


Fig. 139.

In most of the modern current reversers no iron is used as this would influence the magnetic needles of the galvanometers or other highly sensitive instruments.

CURRENT REVERSERS WITH QUICKSILVER.

This is illustrated in Figs. 138 and 139.

In a wooden disc, from 3 to 4 inches in diameter and ¾- inch thickness, bore, about ½ inch from the circumference, four holes from ¼ to ½ inch in diameter and ½ inch deep, in such a way that the four holes form a square as shown. These holes are then filled with quicksilver. In the center glue a wooden upright, about the thickness of a pencil and about 2¼ inches in length. This is used to carry the wooden bar, as shown. In this wooden bar two holes are bored which take two copper wires of No. 10, B. &. S. gauge, and these wires should fit snugly in the holes in the bar. The wires themselves are bent twice at right angles, as clearly shown in our illustration, and these wires must, of course, coincide with the holes in the base of the apparatus. When turning the block with the wires to another position a different connection is had. This can be clearly seen by referring to Fig. 139. The current, therefore, can easily be reversed and without any loss of current.

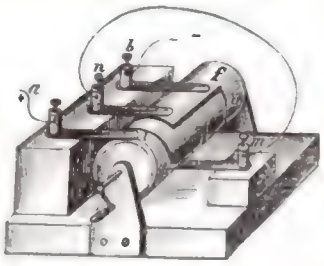


Fig. 140.

The four binding posts B_1, B_2, G_2, G_1, are of the usual screw type, and connected to the four holes, respectively, making contact with the quicksilver.

CYLINDRICAL COMMUTATORS.

This type is shown in Fig. 140.

To a wooden cylinder from 2½ to 4 inches in length, and 1.5 inches diameter, are fastened rings of copper, or brass, about 0.6 inch wide. These rings are shaped in a certain manner as clearly shown in illustration. The rings can be cut from a piece of tubing, if desired, and the three rings themselves can easily be cut from the same piece, as will be evidenced by studying the illustration.

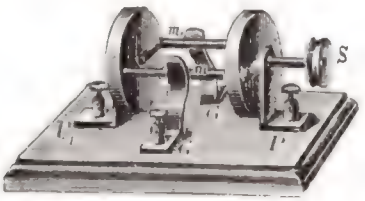


Fig. 141.

In the position shown, the positive current flows from a, through the brush to i k, to the binding post m, and from there to n. If now the cylinder is turned through 180° the positive current will flow from a to k and n to m.

RUHMKORFF'S COMMUTATOR

This arrangement is shown in Fig. 141. Two hard rubber discs about 2 inches diameter are placed as shown. These two discs are held apart by means of the metallic rods m and m_1. The connection is made between m_1 and the bearing P_1, while another connection is made from the metallic rod, m_1, to the bearing P. The current supply is connected with P_1 and P, and is taken off from the brushes G and G_1. By turning the pulley S, m_1 comes in contact with G, and m with G_1, thereby reversing the current.

DUJARDIN'S CURRENT REVERSER.

Fig. 142.

This is one of the earliest current reversers, and is shown in Fig. 142.

The construction of this is so evident from the sketch that we need not say much about it except that the piece which connects the springs F, and F_1, is usually of hard rubber or fibre. If the two strips, F and F_1, are moved to the left the strip, F, comes in contact with a, while F_1 comes in contact with b.

COMMUTATOR TO PROVE THE POLARIZATION CURRENT. SIEMEN'S 1864.

In the center of a small board Figs. 143 and 144, a wooden disc about 2 inches in diameter and 5/8 inch thick is placed so it may revolve around a brass axis. On the edge of the disc, two copper or brass strips are attached, which strips do not touch each other. At the binding posts a, b, c, and d, strong brushes are

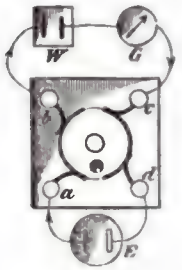


Fig. 143.

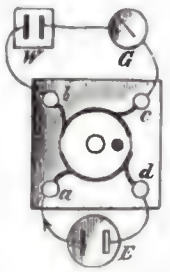


Fig. 144.

attached in such a manner that they slide upon the brass or copper strips, as shown.

By studying Fig. 143, we will see that the current of the battery, E, goes via a and b to the water decomposition cell, W, to the galvanometer, G, to c and d thence back to the battery.

In illustration 144 the disc is turned around 90° and the current of the battery now flows from a to d and back to the battery. The polarization current of W, goes to b, c and from there through the galvanometer, back to the cell, and for that reason the hand will point in the opposite direction.

In Fig. 145 we have illustrated the current reverser of Bertin, and his application for Dujardin apparatus.

By turning the disc by means of the handle at the top the central prong comes in contact with either of the two springs shown. The current is taken off at the posts marked + and —.

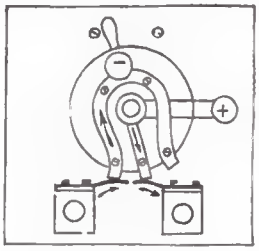


Fig. 145.

Another commutator is shown in Figs. 146 and 147 and here the current is reversed by simply changing the plugs m_1 and m_2 as shown. The metal pieces are usually made of brass, about 1/4 inch thick, and the conections are made to the binding posts B_1, B_2, G_1, and G_2.

Fig. 146.

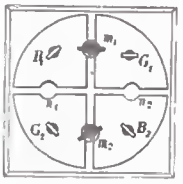


Fig. 147.

It is not well known that an ordinary three point Morse key can be used as a current reverser and the student can easily convince himself of this by experiment.

(To be continued.)

PACIFIC RADIO COMMUNICATING ASSOCIATION.

The Pacific Radio Communicating Association, 1109 Washington street, Vancouver, Wash., has, up to date, about thirty-two members and would be glad to correspond with any other clubs throughout the United States having the same project in mind, the development of radio signaling, and transmission.

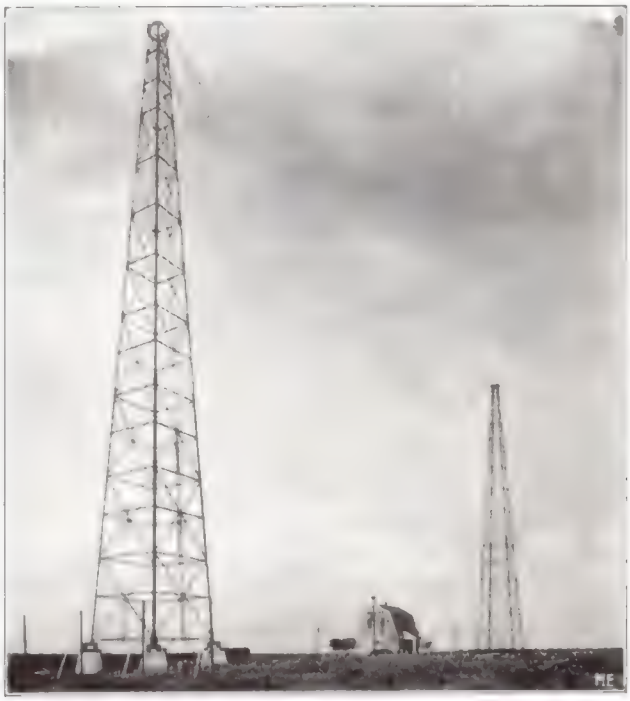
The New 10 K. W. Government Wireless Station At San Antonio, Tex.

By Sidney Friedrich.

The wireless station at Fort Sam Houston, San Antonio, Texas, is a good example of how our Government is extending its wireless communication. Fort Sam Houston is a military post of some consequence, being the second largest army post in this country.

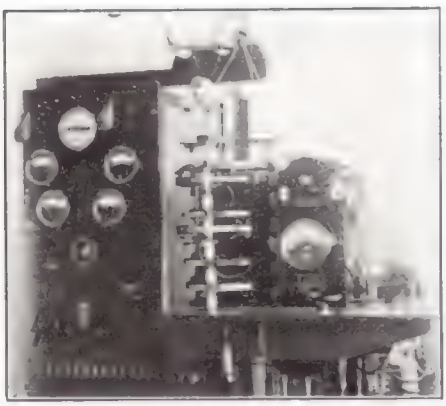
The wireless station has been in operation since last February. The two steel towers rise to an imposing height of 200 feet. The aerial is of the "T' type, consisting of seven heavy phosphor bronze wires 300 feet long. The building in which the apparatus is located is situated in the center of the distance between the towers. It has a second story, which is used by the operators as a rest room.

All of the transmitting apparatus was constructed by the Telefunken Company. The 10-kilowatt transformer, a peculiar cage-like affair, can be noticed on the side of the table (in back of the helix) in the picture that shows the transmitting outfit only. The well-known quenched spark gap is used, giving a high pitched singing spark, which is very advantageous in long distance reading.



THE AERIAL.

The engine room is in the rear of the building. A 20-horsepower Wagner induction motor runs a generator which delivers 220 volts, 500 cycles.



SENDING APPARATUS.

There are two receiving sets; one a Telefunken, the other a Picard, made by the Wireless Specialty Apparatus Co. The latter is most often used. The detectors of this set are Perikon and Pyron. The Perikon detector proves more sensitive, but has a tendency to pick up more static disturbances than the Pyron. Sullivan 5,000-ohm head receivers are used for long distance. Mr. H. F. Jordan, the man shown seated at the table in the picture, is chief operator, and Mr. J. A. Dickson is assistant operator.

Under favorable conditions this station has transmitted 1,500 miles. The operators believe that during the coming winter some good records will be made. The call letters are SA. A few of the sta-

tions that are heard are: Chicago, Ill.; Fort Leavenworth, Kans.; New Orleans, La.; Pensacola, Fla.; Key West, Fla.; Havana, Cuba; Cape San Antonio,

RECEIVING APPARATUS.

Cuba; Colon, Panama; and San Juan, Porto Rico.

UNIQUE AMERICAN AND ENGLISH ELECTRIC PLEASURE BOATS.

By Frank C. Perkins.

Electric motors and storage battery plants have been utilized for driving

16-FOOT ELECTRIC FISHING BOAT.

pleasure boats of various sizes, from the smallest fishing craft to yachts forty or fifty feet in length, with a capacity of from sixty to seventy passengers.

The accompanying illustration, Fig. 1, shows a small 16 foot electric fishing boat of American construction, as utilized on Schroon Lake, for fishing and hunting. The electrical equipment was designed and constructed at Bayonne City, N. J., and consists of a small battery placed under the seats and stern of the boat, the electric motor and controller being mounted near the stern.

In Fig. 2 is shown the large American electric passenger launch "Manhattan." This 42 foot boat was also designed and constructed at Bayonne City, N. J., and has a capacity of nearly three score persons. The battery is placed under the seats and the motor under the floor at the stern, the controller being located near the wheel at the bow.

The English electric launch "Li-

42-FOOT ELECTRIC LAUNCH.

vonia" is equipped with W. Rowland Edwards' single lever gear, and was constructed at the Riverside Works at Weybridge, Surrey, by the Thames Valley Launch Co., Ltd. This 35 foot high speed electric pleasure launch is capable of making 50 miles on one charge easily, it is claimed The boat has 48 Leitner accumulator cells of 200 ampere hours capacity. The motor takes a current of 28 amperes at full speed of 9 miles per hour, and is of the Beever-Edwards type. This Eng-

35-FOOT ENGLISH ELECTRIC.

lish electric launch is used purely for pleasure purposes and has seating capacity for eight persons.

The Disturbing Influence of Solar Raditaion on the Wireless Transmission of Energy

By Nikola Tesla

Editorial Note.—In the following interesting article, Dr. Tesla presents a theory to account for the diminished intensity of wireless signals on account of bright sunlight, which differs radically from the commonly accepted assumption that the effect is due to the ionization of the upper layers of the atmosphere by the ultra-violet rays of the sunlight. It will also be noticed that he does not accept the notion that the signals are transmitted by means of Hertzian or electro-magnetic waves, but explains the phenomenon on an altogether different basis.

When Heinrich Hertz announced the results of his famous experiments in confirmation of the Maxwellian electromagnetic theory of light, the scientific mind at once leaped to the conclusion that the newly discovered dark rays might be used as a means for transmitting intelligible messages through space. It was an obvious inference, for heliography, or signalling by beams of light, was a well recognized wireless art. There was no departure in principle, but the actual demonstration of a cherished scientific idea surrounded the novel suggestion with a nimbus of originality and atmosphere of potent achievement. I also caught the fire of enthusiasm, but was not long deceived in regard to the practical possibilities of this method of conveying intelligence.

Granted even that all difficulties were successfully overcome, the field of application was manifestly circumscribed. Heliographic signals had been flashed to a distance of 200 miles, but to produce Hertzian rays of such penetrating power as those of light appeared next to impossible, the frequencies obtainable

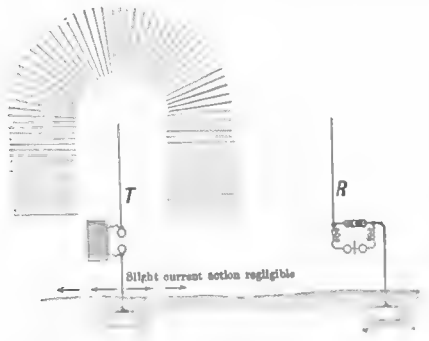


FIG. 1.

through electrical discharges being necessarily of a much lower order. The rectilinear propagation would limit the action on the receiver to the extent of the horizon and entail interference of obstacles in a straight line joining the stations. The transmission would be subject to the caprices of the air and, chief of all drawbacks, the intensity of disturbances of this character would rapidly diminish with the distance.

But a few tests with apparatus far ahead of the art of that time satisfied me that the solution lay in a different direction, and after a careful study of the problem I evolved a new plan, which was fully described in my addresses before the Franklin Institute and National Electric Light Association in February and March, 1893. It was an extension of the transmission through a single wire without return, the practicability of which I had already demonstrated. If my ideas were rational, distance was of no consequence and energy could be conveyed from one to any other point of

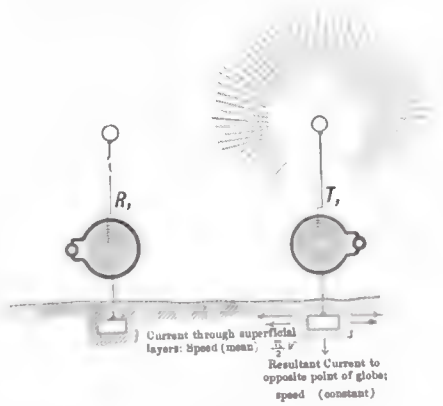


FIG. 2.

the globe, and in any desired amount. The task was begun under the inspiration of these great possibilities.

While scientific investigation had laid bare all the essential facts relating to Hertz-wave telegraphy, little knowledge was available bearing on the system proposed by me. The very first requirement, of course, was the production of powerful electrical vibrations. To impart these to the earth in an efficient manner, to construct proper receiving apparatus, and develop other technical details could be confidently undertaken. But the all-important question was, how would the planet be affected by the oscillations impressed upon it? Would not the capacity of the terrestrial system, composed of the earth and its conducting envelope, be too great? As to this, the theoretical prospect was for a long time discouraging. I found

that currents of high frequency and potential, such as had to be necessarily employed for the purpose, passed freely through air moderately rarefied. Judging from these experiences, the dielectric stratum separating the two conducting spherical surfaces could be scarcely more than 20 kilometers thick and, consequently, the capacity would be over 220,000 microfarads, altogether too great to permit economic transmission of power to distances of commercial importance. Another observation was that these currents cause considerable loss of energy in the air around the wire. That such waste might also occur in the earth's atmosphere was but a logical inference.

A number of years passed in efforts to improve the apparatus and to study the electrical phenomena produced. Finally my labors were rewarded and the truth was positively established: the globe did not act like a conductor of immense capacity and the loss of energy, due to absorption in the air, was insignificant.

FIG. 3.

The exact mode of propagation of the currents from the source and the laws governing the electrical movement had still to be ascertained. Until this was accomplished the new art could not be placed on the plane of scientific engineering. One could bridge the greatest distance by sheer force, there being virtually no limit to the intensity of the vibrations developed by such a transmitter, but the installment of economic plants and the predetermination of the effects, as required in most practical applications, would be impossible.

Such was the state of things in 1899 when I discovered a new difficulty of which I had never thought before. It was an obstacle which could not be overcome by any improvement devised by man and of such nature as to fill me with apprehension that transmission of power without wires might never be quite practicable. I think it useful, in the present phase of development, to acquaint the profession with my investigations.

It is a well known fact that the action on a wireless receiver is appreciably weaker during the day than at night, and this is attributed to the effect of sunlight on the elevated aerials, an explanation naturally suggested through an early observation of Heinrich Hertz. Another theory, ingenious but rather fine-spun, is that some of the energy of the waves is absorbed by ions or electrons, freed in sunlight and caused to move in the direction of propagation. The *Electrical Review and Western Electrician* of June 1, 1912, contains a report of a test, during the recent solar eclipse, between the station of the Royal Dock Yard in Copenhagen and the Blaavandshuk station on the coast of Jutland, in which it was demonstrated that the signals in that region became more distinct and reliable when the sunlight was partially cut off by the moon. The object of this communication is to show that in all the instances reported the weakening of the impulses was due to an entirely different cause.

It is indispensable to first dispel a few errors under which electricians have labored for years, owing to the tremendous momentum imparted to the scientific mind through the work of Hertz, which has hampered independent thought and experiment. To facilitate understanding, attention is called to the annexed diagrams, in which Fig. 1 and Fig. 2 represent, respectively, the well known arrangements of circuits in the Hertz-wave system and my own. In the former the transmitting and receiving conductors are separated from the ground through spark gaps, choking coils, and high resistances. This is necessary, as a ground connection greatly reduces the intensity of the radiation by cutting off half of the oscillator and also by increasing the length of the waves from 40 to 100 per cent., according to the distribution of capacity and inductance. In the system devised by me a connection to earth, either directly or through a condenser, is essential. The receiver, in the first case, is affected only by rays transmitted through the air, conduction being excluded; in the latter instance there is no appreciable radiation and the receiver is energized by cur-

rents conducted through the earth while an equivalent electric displacement occurs in the atmosphere.

Now, an error which should be the focus of investigation for experts is, that in the arrangement shown in Fig. 1 the Hertzian effect has been gradually reduced through the lowering of frequency, so as to be negligible when the usual wave-lengths are employed. That the energy is transmitted chiefly, if not wholly, by conduction can be demonstrated in a number of ways. One is to replace the vertical transmitting wire by a horizontal one of the same effective capacity, when it will be found that the action on the receiver is as before. Another evidence is afforded by quantitative measurement, which proves that the energy received does not diminish with the square of the distance, as it should, since the Hertzian radiation propagates in a hemisphere. One more experiment in support of this view may be suggested. When transmission through the ground is prevented or impeded, as by severing the connection or otherwise, the receiver fails to respond, at least when the distance is considerable. The plain fact is that the Hertz waves emitted from the aerial are just as much of a loss of power as the short radiations of heat due to frictional waste in the wire. It has been contended that radiation and conduction might both be utilized in actuating the receiver, but this view is untenable in the light of my discovery of the wonderful law governing the movement of electricity through the globe, which may be conveniently expressed by the statement that the projections of the wave-lengths (measured along the surface) on the earth's diameter or axis of symmetry of movement are all equal. Since the surfaces of the zones so defined are the same the law can also be expressed by stating *that the current sweeps in equal times over equal terrestrial areas.* (See among others "Handbook of Wireless Telegraphy," by James Erskine-Murray.) Thus the velocity of propagation through the superficial layers is variable, dependent on the distance from the transmitter, the mean value being $\pi/2$ times the velocity of light, while the ideal flow along the axis of propagation takes place with a speed of approximately 300,000 kilometers per second.

To illustrate, the current from a transmitter situated at the Atlantic Coast will traverse that ocean—a distance of 4,800 kilometers—in less than 0.006 second with an average speed of 800,000 kilometers. If the signalling were done by Hertz waves the time required would be 0.016 second.

Bearing, then, in mind that the receiver is operated simply by currents conducted along the earth as through a wire, energy radiated playing no part, it will be at once evident that the weakening of the impulses could not be due to any changes in the air, making it turbid or conductive, but should be traced to an effect interfering with the transmission of the current through the superficial layers of the globe. The solar radiations are the primary cause, that is true, not those of light, but of heat. The loss of energy, I have found, is due to the evaporation of the water on that side of the earth which is turned toward the sun, the conducting particles carrying off more or less of the electrical charges imparted to the ground. This subject has been investigated by me for a number of years, and on some future occasion I propose to dwell on it more extensively. At present it may be sufficient, for the guidance of experts, to state that the waste of energy is proportional to the product of the square of the electric density induced by the transmitter at the earth's surface and the frequency of the currents. Expressed in this manner it may not appear of very great practical significance. But remembering that the surface density increases with the frequency it may also be stated that the loss is proportional to the cube of the frequency. With waves 300 meters in length economic transmission of energy is out of the question, the loss being too great. When using wave-lengths of 6,000 meters it is still noticeable though not a serious drawback. With wave-lengths of 12,000 meters it becomes quite insignificant, and on this fortunate fact rests the future of wireless transmission of energy.

To assist investigation of this interesting and important subject, Fig. 3 has been added, showing the earth in the position of summer solstice with the transmitter just emerging from the shadow. Observation will bring out the fact that the weakening is not noticeable until the aerials have reached a position, with reference to the sun, in which the evaporation of the water is distinctly more rapid. The maximum will not be exactly when the angle of incidence of the sun's rays is greatest, but some time after. It is noteworthy that the experimenters who watched the effect of the recent eclipse, above referred to, have observed the delay.

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Early Galvani Experiments

The following illustrations which are taken from some very rare and almost priceless books have never appeared previously in any magazine and show some of the early experiments of Galvani.

Fig. 1 shows the famous frog experiment, the illustration being copied from a copper plate engraving in the book "De Viribus Electricitatis in Motu Muscalari," by Aloysii Galvani, published in the year 1771.

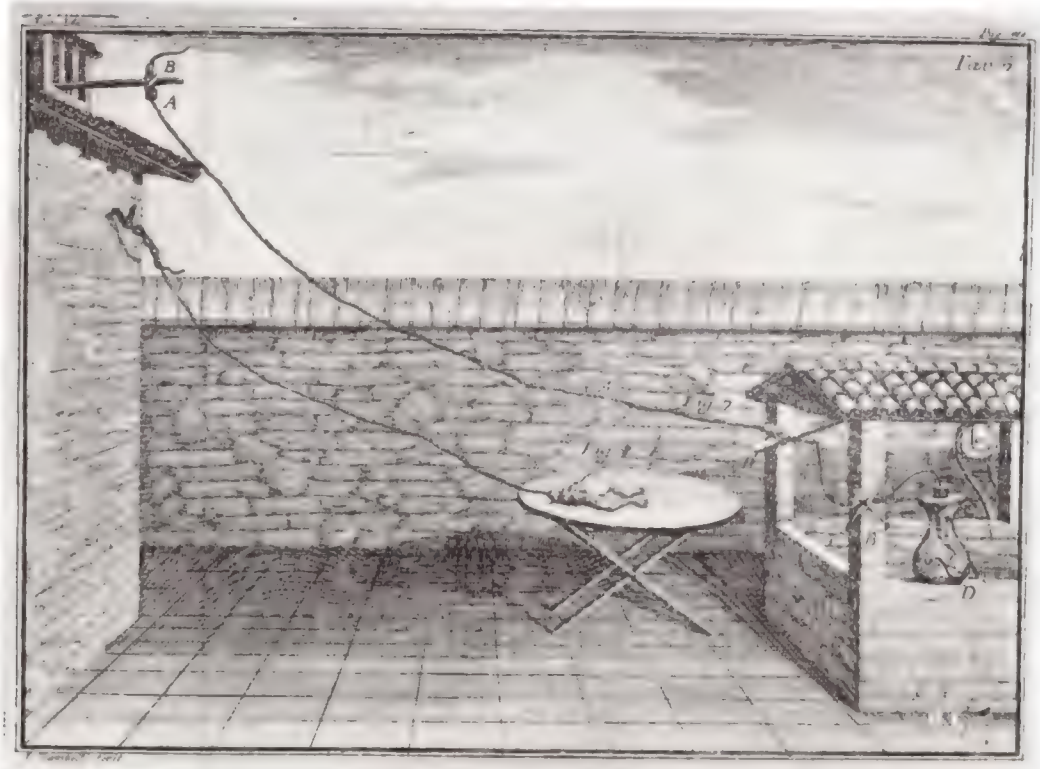


FIG. 1.
Note that no return circuit is provided for.

It shows the frog lying on a table with a wire through its spine. Another frog will also be seen, encased in a glass bottle standing on the curb of the well, D. This illustration proves conclusively that Galvani himself at the time this book was published did not understand contact electricity. As will be clearly seen in the illustration, no return circuit is provided for, and if any action would take place at all it could only be through the effect of static electricity which, of course, has nothing to do with contact electricity as we understand it to-day.

Fig. 2 shows similar arrangements, and from it will be seen that Galvani as is well known, thought the frog leg to be nothing but a leyden jar which became active under the influence of static electricity. The static machine and the leyden jar on the table proves this conclusively.

A curious experiment is shown in the same illustration, and marked Fig. 3.

On a pedestal, G, stands a bottle, A, in which a frog is suspended. By connecting at C, and operating the static machine the frog will act very much like an electroscope, and the frog's legs will be jerked up vigorously as long as sparks from the machine are transmitted to the wire, F. From this we see conclusively that Galvani worked in an altogether wrong direction, and he died without having really grasped the principle of contact electricity.

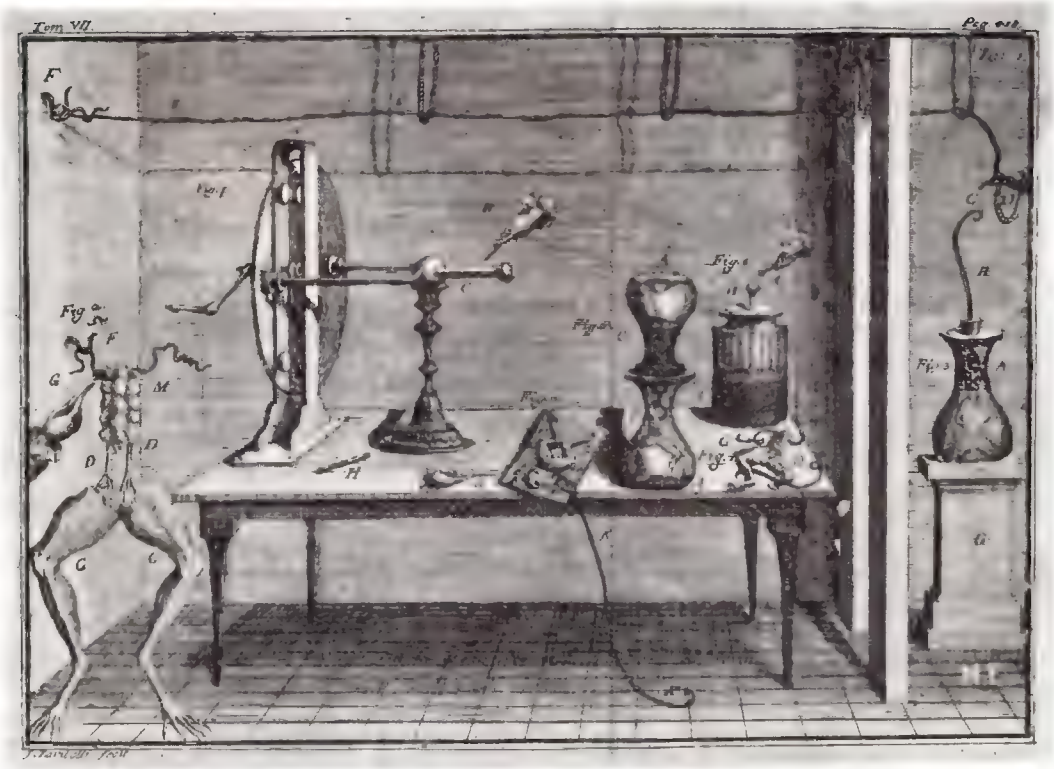


FIG. 2.
This shows Galvani thought, the action to be due entirely to static electricity.

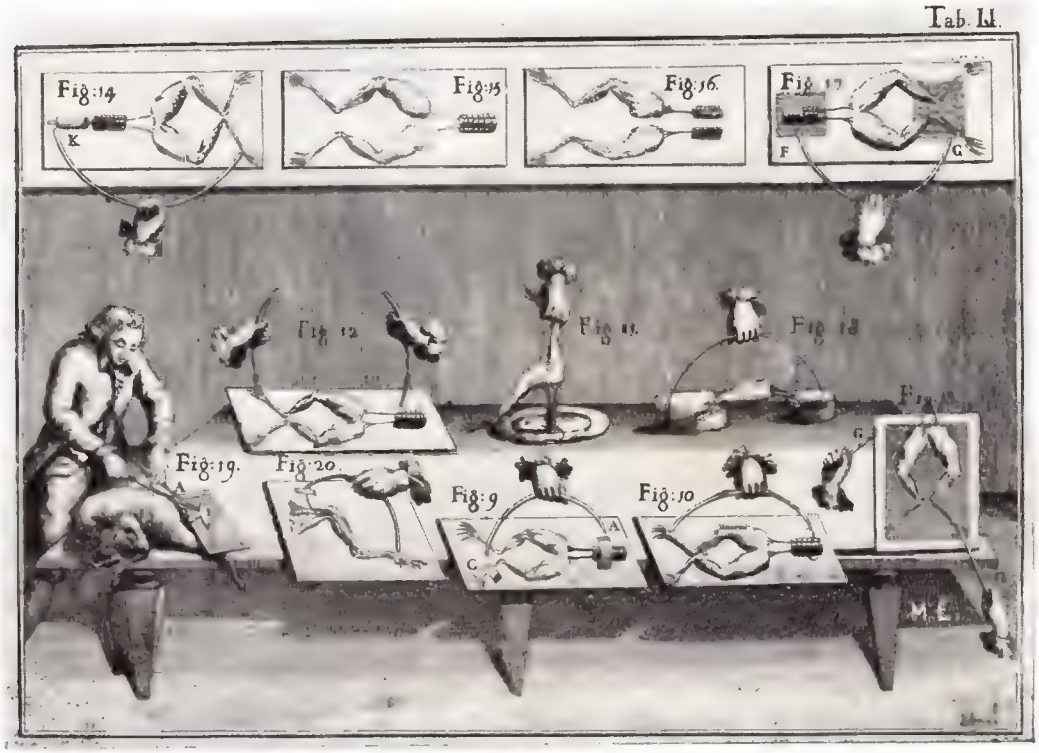


FIG. 3.
Note Fig. 12, First reference to contact electricity.

Our Fig. 3 is taken from the valuable book entitled "Aloysii Galvani," by Johannes Aldini, of the year 1792.

This curious illustration shows a good many applications of the famous frog experiment, especially Fig. 12 brings this still closer to the ultimate contact electricity, and this feature is particularly interesting, inasmuch as even Aldini himself did not, at that time, fully understand the action.

An interesting experiment is also seen from the same plate, Fig. 9. It will be seen that different methods are used, this no doubt producing a pure Galvanic action upon the frog leg.

This is also seen in the reference Fig. 20. Also Fig. 14 and Fig. 17.

Our illustrations are very valuable in that they show the student the various stages of an important discovery, and how important the investigators must have thought a simple phenomenon, to be, to go to so much trouble and devise so many different experiments in order to discover something really new.

Along The Great White Way.

Photo O. J. Gude Co., N. Y.

We present this month the first of a series of photographs and descriptions of notable electric signs, in the theatre district of New York City. This sign, erected by O. J. Gude Co., for A. G. Hyde & Sons, manufacturers of "Hydegrade" products, is an advertisement of the Halcyon Messaline Petticoat. When in operation, it shows a girl constantly skipping rope, the action being quite lifelike. At the same time the reading matter composing the rest of the sign is flashed on and off at short intervals.

The sign is 32 feet high by 50 feet long. The girl is 28 feet tall; her head, 4 feet high by 3 feet wide; each of her arms, 7 feet long; and her arms, outstretched, measures 18 feet. The letter, H, is 8 feet high; the rope, 28 feet long, and the sign contains a total of 1,668 lamps.

This sign, located at Forty-second street and Seventh avenue, is in what might be termed the heart of the the Great White Way. In the one block, west of the sign, on Forty-second street, are seven theatres; and within four blocks there are twenty-seven theatres, eight large hotels, and a dozen popular restaurants and clubs.

This Month's Cover

BEGINNING with this issue we will, until further notice, change our cover every month, each cover showing a different historical electrical invention, and we think the idea will be welcomed by our readers.

Luigi Aloisio Galvani was born September 9, 1737, at Bologna, Italy.

He first studied theology; and was only kept from the convent with great difficulty. Later he studied medicine, and in 1762 he was made a professor, in this capacity, at Bologna. During this time he published several dissertations on the anatomy of birds, which, however, were not seriously considered.

LUIGI ALOISIO GALVANI.

The revolution brought sad days for Galvani. In the year 1796 Bonaparte obtained the command of the French armies in Italy and forced the King of Sardinia to peace. A part of Parma in 1797 became a republic. Galvani refused to declare the republican oath, and through this he lost his position. The position was offered him afterwards by the republic, but his health had become so bad that he was no longer able to fill his duties, and he died shortly afterwards, quite poor, on the 4th of December, 1798.

While it is not now possible to give the exact date at which Galvani made the famous "frog" experiment, from which modern electricity takes its birth, it is agreed to-day that the year 1770 is undoubtedly the one in which Galvani first made his experiment.

There are several versions of the discovery, and the one which has of late received most credence is described by Whewell.

Galvani was in the habit of prescribing, for his wife, frog soup on account of her poor health, and this soup Galvani used to prepare himself. By chance, some freshly skinned frogs' legs were laid on the table, in close proximity to an electric friction machine. An attendant accidentally touched one of these legs with the point of a knife, and Galvani's wife was very much surprised to see the frog's leg jerk violently. She told this to Galvani, who repeated the experiment immediately, and afterwards continued it in various ways. He found that the twitching of the frog's leg would always appear when the electric friction machine was worked, if, at the same time, the frog was in contact with an electric conductor such as, for instance, a metal wire.

Although Galvani's discovery was purely accidental, it must be said, to his credit, that he followed the experiment carefully, and, although he did not fully realize what his discovery really meant, he deserves full recognition for it.

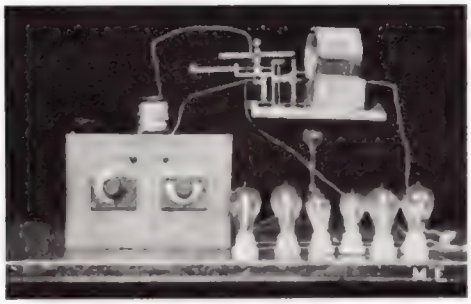
Until his death Galvani thought that the frog leg represented a certain kind of leyden jar, in which the muscles were the outer, the nerves the inner coatings of the jar. He thought that the connection of the nerves with the muscles through a wire would produce a discharge, and, through this, the jerking movement of the frog's leg would be the result.

Experiments with the Musical Arc

By Stanley E. Hyde.

The singing or musical arc was discovered by Duddell in 1900, and on its principle of operation is founded the present wireless telephone (Arc System). It consists as shown in Fig. 1, and the accompanying photograph, of an arc lamp which is supplied with a constant direct-current and around which is shunted a condenser and inductance in series, the capacity of the condenser being variable. The arc should not consume more than from 3 to 5 amperes and must be kept from hissing or spluttering.

The action which is supposed to take place is as follows: When the capacity and inductance are shunted across the burning arc the condenser takes on a



charge and the current through the arc diminishes to a small extent, the voltage thereby increases and charges the condenser to a still higher potential. The self induction of the inductance coil keeps the current flowing in the same direction for a very short interval, which results in the condenser becoming charged to a potential which is higher than that of the arc, and as soon as the current stops flowing the condenser discharges across the arc through the inductance and charges in the opposite direction. It does this a great many times in a second and persistent and undamped oscillations are set up in this closed circuit.

The inductance in this case consists of 50 turns of No. 10 copper wire wound on a spool as shown in the photo on top of the condenser case. The condenser is made up of two units, one consists of capacities from .01 MF to .1 and the other from .1 to 1 MF, respectively. The different capacities are cut in by the two multi-point switches on the front of the condenser case.

The arc lamp need not be a very elaborate one but can consist of any arc lamp that is adjustable by hand, as the arc length that is formed by a self-regulating lamp is not suitable for the formation of the oscillatory current. A hand adjusted steriopticon lamp is just the thing for this purpose and is of the type shown.

A lamp bank is connected in series with the current supply and is used to regulate the amount of current that the arc draws. In adjusting the apparatus the arc is adjusted with one hand while the condenser is varied with the other until the arc gives out a shrill musical note, then by moving the switch on the condenser back and forth different notes can be produced which can be heard in a large room very plainly and any other arc light that is supplied off the same circuit will give forth the same notes that are formed at the closed oscillation circuit of the first. The writer became aware of this by having his attention called to the fact when the singing arc was in operation it effected another lamp which was being used for throwing pictures on to a screen, much to the amusement of the audience.

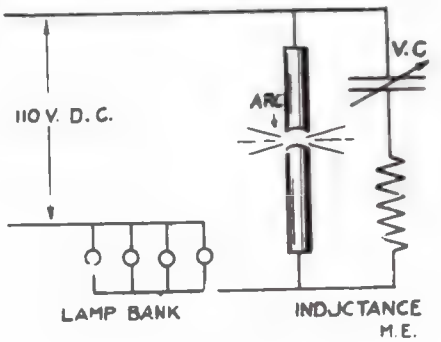


FIG. 1

The highest pitches are obtained when a small capacity is used; the reason being that the natural period of oscillation of the circuit varies inversely with the capacity of the condenser, according to the well-known formula:

$$\text{Frequency} = \frac{1}{2\pi\sqrt{LC}}$$

wherein, C is the capacity of the condenser, in farads, and L is the inductance of the coil, in henries. The value of the frequency obtained is in cycles per second, which, in this case, corresponds to the number of complete vibrations per second of the musical tone produced.

In Fig. 2 is shown a method for making different notes of the scale by pressing keys that connect capacities in series with the inductance, they being smaller as the scale goes up. B is a strip of brass about a foot long and an inch wide that is screwed to a board or other suitable support. The keys are made of small brass rod threaded on the top end and a hard rubber knob screwed on. These keys are held up by little springs shown at A. The under contacts are made of squares of brass or copper as the current to be broken is very low in amperage and will not arc at all. The largest condenser is marked as 1 of the scale and the next largest as 2, etc.

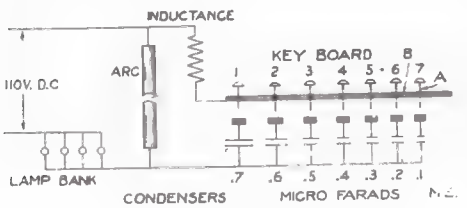


FIG. 2

If the reader is fortunate enough to have a telephone transmitter that will not burn out when carrying comparatively large currents the arc can be changed to a talking arc by shunting the special transmitter around the arc as shown in Fig. 3. A good transmitter for heavy currents can be made in the following way: Secure four ordinary telephone transmitters and a wooden bowl, similar to those used as mortars for pounding up chemicals, etc. The transmitters are screwed around the inside of the bowl so their speaking trumpets are all focused toward the centre of the bowl. When this is arranged they are connected in parallel and the lead wires brought to the binding posts either on the bowl or to some other support to which the bowl is screwed. The curvature of the wooden bowl serves to catch and concentrate the sound waves into the four transmitters thus making the reproduced speech much louder in the arc. When the arc is set up for operation the transmitter is connected preferably in some other room than the one in which the arc lamp is, so that the person speaking into the transmitter will not be confused with the reproduced words. It is a very nice experiment to get the arc to reproduce the original words, but it can be accomplished and the results are more than gratifying. Placing a phonograph before the transmitter will give excellent results as musical sounds are reproduced from the arc much better than words.

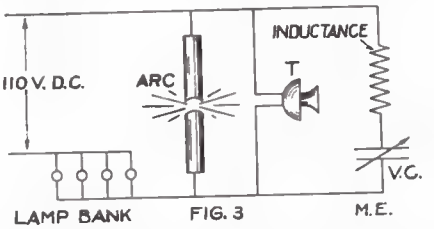


FIG. 3

As this transmitter will respond to heavy currents it might be used satisfactorily in connection with wireless telephone experiments. When using as a telephone the condenser is adjusted until the frequency is so high that the sound is no longer perceptible to the ears. In all these experiments the lamp bank must be used so they will serve the double purpose of offering resistance and choking back high frequency currents from the source of energy and make it discharge across the arc.

EAST GLENVILLE WIRELESS CLUB.

The East Glenville M. E. Wireless Club wishes to announce its organization on the night of June 25, 1912.

Our aim is to help amateurs in the study of electricity and to become good wireless operators. We started with eleven members.

The officers are: D. Bennett, president; G. Aldridge, vice-president; J. Battles, treasurer; F. Russell, secretary; S. Aldridge, director.

We would like to hear from other amateur clubs.

Address all communications, F. A. Russell, 634 East One Hundred and Twenty-fourth street, Cleveland, Ohio.

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H. GERNSBACK, Editor

O. J. RIDENOUR, Business Manager

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Vol. V. SEPTEMBER No. 6

EDITORIAL.

IN our June issue we called attention to the fact that the Alexander Bill in its new state (S. 6412) passed the Senate on May 7th. We now have to report with gratification that on August 9th the House passed the bill and on August 17th President Taft signed the bill, and it is therefore now a law.

We call the readers' attention to our Editorial in the June issue and also refer to the Editorial in the July issue, from which it will be seen that the new law will be of great benefit to all parties concerned.

The amateur knows now, absolutely where he stands, and what he can do, and he cannot be harassed any more by unscrupulous officials, be they Government or working for Commercial Companies. The amateur now knows exactly what his rights are, and under the new law, he will have far more rights than he ever had before the law passed.

The new law will go into effect 90 days after its passage, in other words, November 17th will be the date of its actual enforcement.

The Secretary of Commerce and Labor, at Washington, will no doubt have printed, a set of rules which can be had for the asking, if proper application is made.

The amateur should remember, above all, that this law is not made to curb the amateur, as much as to help him along in his experiments. All that is required is that he use a certain wave length and that he should not wilfully interfere with other people's business.

This magazine has always stood for this, and the owners of *Modern Electrics* are to be congratulated that the long fight has been won in favor of the amateur, as not alone has he now all the liberties he had before, but has a great deal more liberty, and, at the same time, his experiments are endorsed by the Government with its official stamp. He is no longer considered a pest, but is now considered in the same light as a Government or Commercial operator, having his own rights the same as they.

It should be distinctly understood therefore that the amateur may continue his activities as before, except that he must not use a greater wave length than 200 metres, nor use a greater power than 1 kw. in either his transformer or spark coil; nor must he use more than ½ kw. if he is within five nautical miles of a Government Station.

A glance at the chart of the Wireless Blue Book gives the location of the Government Stations and the amateur can readily keep himself informed on this point. As to the wave length we refer the student to the very comprehensive article published in the March and June, 1912, issues of this magazine, entitled "Limited Wave Lengths."

We will from time to time publish all new information regarding the new wireless law, and will keep our readers fully posted on any such matters.

ELECTRICITY AS FOOD.

We print the following cable dispatch to the New York Times in their issue of August 5th:

"If a man is hungry, give him electricity. If he asks for bread or beefsteak, put him in an electric chair and turn on the current."

This paradoxical method is recommended by Prof. Bergonie of Bordeaux, who has been telling his medical colleagues at Nimes of the curious results of his experiment.

According to the professor, food can be replaced by electricity as nourishment for the human system. Low tension and high frequency electric currents—that is, such currents as one gets from an induction coil or from the instruments often seen at fairs, which used to pass currents through persons holding the terminals—passing through the body, he says, have the same effect in producing interior warmth as meat and bread. But there is this advantage over food, that they do not tax the digestive organs.

These currents can be employed, the professor says, without the slightest deleterious effect.

Dr. Bergonie says his treatment will prove invaluable in the cases of invalids, who will be able to assimilate energy in an electric form. He adds

"In many cases I observed that my electric treatment led to a notable increase of weight."

This certainly is a startling discovery—if discovery it can be called.

Dr. Bergonie, in his dispatch, however, does not state how long one can go without eating after being treated electrically; and it has occurred to us that we now understand, perfectly well, why electrocuted individuals wear such happy expressions on their faces. The reason is, we think, that they will surely not get hungry any more, after being treated with the electrocuting process.

THE FIRST TELEGRAPH

We are very fortunate in being able to reproduce herewith the first authentic reference to an electric telegraph; and this is the very earliest mention of any telegraph that has ever appeared in print, anywhere.

Our illustration shows a page taken from the book of Janus Hercules De Sunde. This book was published in the year 1600 in Erfurth, Germany, and, as will be seen, De Sunde had a very clear conception of what the future telegraph should be like.

He says in his description "That it should be possible to transmit intelligence for two or three miles *where we cannot either see or hear.*" It is quite remarkable that he also should have given as an illustration, the compass, upon which he proposed to throw some energy. This is all the more remarkable for the reason that the earliest electromagnetic telegraphs were actually operated by a similar means.

This again proves conclusively that great inventions are not discovered suddenly, but are usually foreshadowed by correct prophecies.

128 Wie man durch Spiegel in die ferne

ſtrichen die vier ort der Welt angedeutet / nemlich / der Auffgang / Mittag / Nidergang / vnd Mitternacht / wie in folgender Figur zuſehen.

ORIENS.

ABCD.

SEPTENTRIO.

ONRS.

EVGH.

MERIDIES.

IKLM.

OCCIDENS.

Ferner / ſo ſchreibet man in beyden Compaſſen zu dem Auffgang die vier Buchſtaben A B C D. zu dem Mittag / die vier buchſtaben E V G H. zu dem Nidergang I K L M. Letzlich zu Mitternacht O N R S. So ſeynd beyde Compaſſen bereytet.

Zum andern muß man haben zwey ſubtile vnd

Simple Experiments in Alternating Currents

(Continued.)

By P. Mertz.

16. Besides the voltmeter and ammeter for measuring current, there is also the *recording wattmeter*. This registers the number of watt-hours (or kilowatt-hours) used on the circuit from the time the instrument was set to zero to the time when the reading is taken.

A simple type that you can easily make is shown in Fig. 28. Before making this you will have to have the creeping field motor described in § 10.* This is the only motor of those given that you can use for this, as none of the others are self-starting.

You should then prepare a base, A upon which to mount your wattmeter. Upon the shaft of the motor (at the end opposite the binding posts) is forced a worm-wheel, B, preferably 32 pitch or

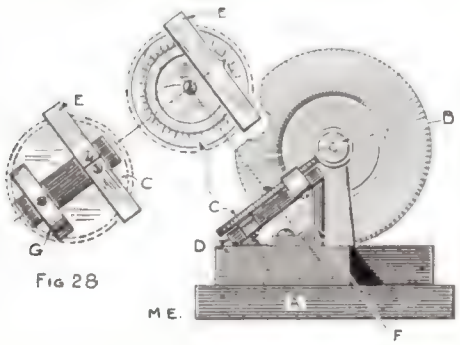


Fig 28

finer. This worm-wheel actuates the gear-wheel, C, which should also be of 32 pitch; and care should be taken to see that the two mesh properly. C is pivoted on a screw on a piece of fibre, D, to which is also fastened the index, E. This piece of fibre, D, is hinged to the base, A, so that when the meter is to be reset to zero, all there is to do is to lift the gear, C, out of mesh with B, and adjust it. A stop, F, is arranged so that C normally stays in mesh with B. You can then screw a damping-spring, G, to the back of the piece, D, to prevent C from rotating too fast. It should bear evenly and smoothly on the back of the gear-wheel, and must not press so hard as to stop it. A paper scale can be glued on the upper face of the gear-wheel, C, for E to indicate upon. This scale can be graduated arbitrarily, or can be calibrated when the instrument is finished.

*See p. 268, June issue.

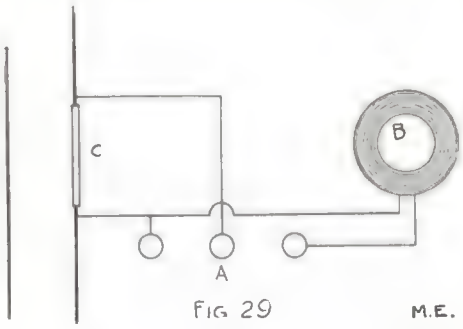


Fig 29 M.E.

The connections for the instrument are shown in Fig. 29. A represents the motor binding-posts, B is the choke-coil, while C is a non-inductive resistance, having preferably less resistance than the wattmeter. Since the two have not the same time constant the meter will *lag* behind the main current; that is, it will act as a choke coil. If the meter is always to be used on currents of the same frequency this will not impair its accuracy, but if conditions require it to measure currents of different frequencies, some sort of variable resistance should be placed in series with the motor, to adjust the latter to the various frequencies.

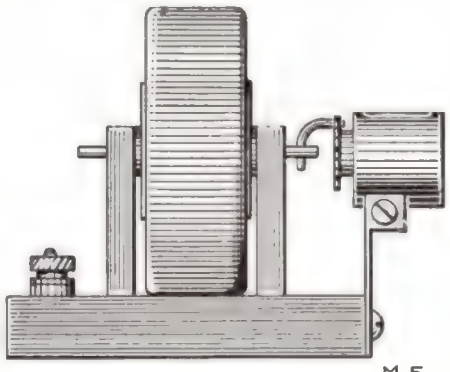


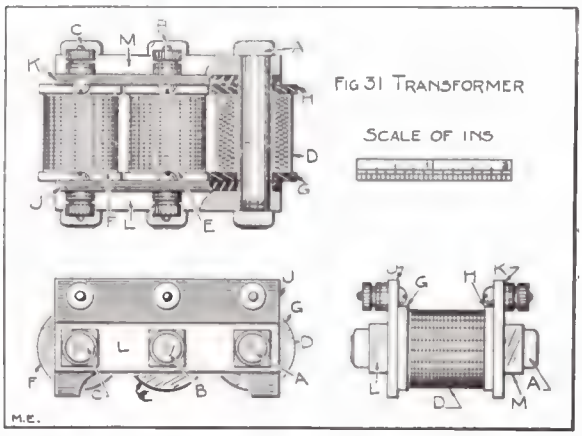
Fig.30 M.E.

This meter cannot record for a long time on account of the fact that the gear-wheels move too fast. If the capacity

is to be increased a good way to do it is to mount a bicycle cyclometer on the motor (Fig. 30) and actuate it by a small bent pin on the shaft. The only trouble with this is that a cyclometer is not always at hand; otherwise it is more easily made than the one described before.

A. C. TRANSFORMERS.

A piece of apparatus that has become one of the most widely used in alternating currents, especially since its adoption into a new field, wireless telegraphy, is the *transformer*. It is, with very little exception, the only instrument used at the present time, to produce the sparks required in long-distance wireless telegraphy. It also has a great number of other fields of use in power transmission. Following will be described some simple experiments that will enable you to easily grasp the principles involved in its operation, if you do not already know them.

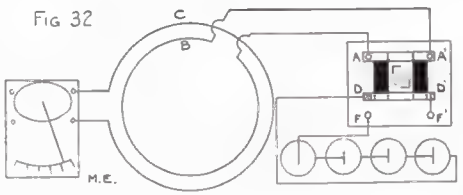


17. Before you can begin any experiments, you must construct a small experimental transformer, shown in Fig. 31.

Three carriage or stove bolts, A, B, and C, form part of the core. Over these are wound the coils, D, E, and F, respectively. The bobbins for these are made by first winding one layer of paper over the core, without glueing it or shellacking it in any way. Over this wind several more layers, shellacking these together, but taking care that they do not stick to the first. Over these are slipped and shellacked in place the coil-heads, G and H, which can be of strong cardboard, cigar box wood, veneer, hard rubber or fibre; preferably the latter. These should have small holes to lead out the beginning and end of the winding. Each bobbin must be wound with about 3 oz. No. 24 B & S S. C. C. C. magnet wire, or enameled wire if preferred. Care should be taken that all three coils are wound in the same direction. After the winding is finished, they can easily be slipped off the cores if the first thicknesses of paper were wound loosely, as above mentioned. The latter can be left out altogether in the finished transformer.

The terminals of these coils are led out to binding-posts fastened to the supports, J and K. These can be of the same material as are the coil-heads. They are clamped under the yokes, L and M, (which form the rest of the core), by the carriage bolts. If iron ¼ inch thick cannot be obtained, it is just as well to use two thicknesses of ⅛-inch iron, or four of 1/16 inch. It may here be mentioned that all the iron to be used in this transformer must be the softest possible to obtain, or the efficiency will be lowered to such an extent that the experiments to be described cannot be performed with it.

18. Connect two parallel loops of wire, B and C, each about a foot in diameter, to the rotary converter (§ 1)* a few dry cells, and an ammeter or voltmeter of the modified D'Arsonval (§ 14)† or inclined-coil (§ 13)‡ type, as shown in Fig. 32. You will notice that as soon as the converter starts rotating, the needle on the meter will be deflected.



This is due to the fact that the magnetic lines of force generated around B create a disturbance in C, which sets up an electric current in it. The magnetic field must be varying, or no current will be generated, (more technically, *induced*), in C. It has been found that it takes

* See p. 154, May issue.
† See p. 476, August issue.
‡ See p. 363, July issue.

100,000,000 magnetic lines of force per second, threading one turn of wire (like C) to induce a pressure of one volt in that wire.

From this it will be seen that if a greater number of turns of wire are used, and iron used instead of air to conduct the magnetism, the efficiency will be greatly increased. Such an instrument is found in the transformer just described.

Substitute for the two loops of wire, B and C, in Fig. 32, the middle and one end coil of the transformer (§ 17), as shown in Fig. 33, and, the other instruments being the same, the deflection on the meter will be much greater.

You can measure, accurately enough, the efficiency of the transformer by connecting the recording wattmeter (§ 16), first, across the primary circuit, then across the secondary circuit, for the same length of time each. One hundred

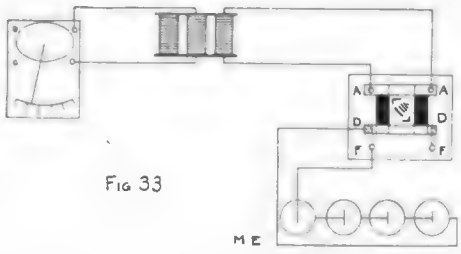


Fig 33

times the first reading, divided by the second, is the efficiency, in per cent. It will, with this transformer, be less than 50 per cent., on account of the magnetism flowing through the unused end coil (which, however, will be necessary in future experiments). It can be raised by temporarily removing the bolt serving as the core for this coil.

The varying magnetic field, while inducing a current in another wire, will also induce one in the wire which generated it. This effect is known as *self-induction,* and since the induced current is opposed to the inducing current, the result will be a choking back of the latter. This is the principle upon which the action of the choking, or reactance coil depends. This choking is also found in high-voltage A. C. power transmission, where it is an important factor to be taken into account. Another adaptation of this principle is found in the *auto-transformer.* In this transformer, an example of which is found in an ordinary wireless telegraph tuning coil, the primary coil consists of the whole winding (in the case of the tuning coil, often an adjustable part of it) while the secondary coil consists of part of the same winding, or vice-versa.

When the core is of iron, a current is induced in it, just as if it were a secondary winding, and these currents (known as eddy currents) are a waste of energy and cause heating of the core. To stop this action, the core is usually laminated, the adjoining laminations being insulated from each other, so that no current can pass.

In power transformers, the relation between the primary and secondary windings is such that nearly all the magnetic lines of force set up by the primary winding, cut the secondary winding and are useful in inducing currents in the latter. In transformers operating on extremely high frequency currents, such as the Tesla coil, and those used in wireless telegraphy and telephony, the relation is such that comparatively few of the lines of force cut the secondary winding. It might be expected that the efficiency of transformation in the latter case would be very low. That this is not the case is due to the fact that the two circuits are so tuned that full advantage is taken of the principle of resonance, and the secondary voltage and current build up to values far beyond those possible from a purely transformer action.

In the case of power transformers we avoid resonance at all costs, for the reason that where the period of alternation is low, due to the large amounts of capacity and inductance involved, sometimes enormous voltages, and at other times enormous currents are set up, which break down the insulation or burn out the conductors, and disable or destroy the apparatus.

(To be continued)

GERMANTOWN WIRELESS CLUB.

The Germantown Wireless Club would be glad to hear a few sparks either in person or by wireless, from any Amateur who is interested in wireless, and living in Germantown, at their "Little Home," 5801 Germantown avenue, Germantown, Pa. Call letters, XA.

Electrically Heated Coverlets

By Frank C. Perkins.

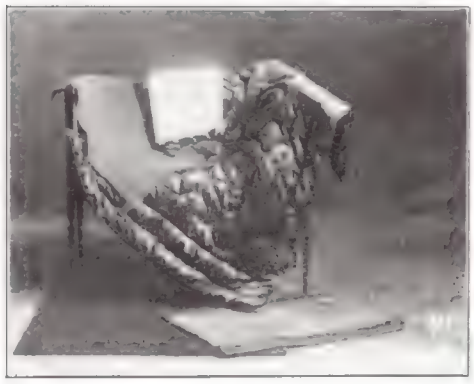
The accompanying illustration shows an electrically heated coverlet of French design. It is said the heating furnished by the electric thermophile is far ahead of systems of heating heretofore used. Such heating can be obtained wherever the electric current is already used for lighting and that by means of electrically heated carpets, coverings, coverlets and lace fabrics which by their suppleness, their elegance and their comfort, are adapted to all the exigencies of the most luxurious modern installations.

It presents no danger of fire, it is maintained, and is very simple. It cannot give a greater heat than that for which it has been arranged, provided that when in use it is completely spread out in the free air, and is working at the voltage arranged. It is hygienic, with neither smoke nor gas, and borrows no element from the atmosphere, no more than an incandescent lamp. It produces no electrolytic action. It warms persons and even the air by contact. The thermophile carpet creates the real heat syphon of the atmosphere, it warms the body, giving a mild and absolutely uniform temperature, and finally realizes in the purest air a cool head and warm feet, the acme of hygiene.

It is said to be economical if it is duly considered that it affords the best yield over large surfaces and that it instantaneously transforms into heat all the electricity it receives.

The electric thermophile by all its advantages of comfort and of hygiene offers the ideal of domestic warming in its numerous applications of soft carpets of all dimensions, as foot warmers, oriental carpets, oriental gobelin woven with electric thermic threads and with all the most beautiful colorings of supple and light coverings for long chairs, of instantaneous bed warmers, of elegant counterpanes of great luxury, in which warmth is obtained at will.

All kinds of material may be employed in the manufacture and covering of thermophile fabrics in order to permit of the most complete applications in the most modern habitations. The electric thermophile is made generally so as to give 85 to 95 deg. F. for carpets, and 70 to 80 deg. F. for coverlets, above the surrounding temperature. It can be made for all tempera-



tures, but those mentioned are the most agreeable, in order to avoid inconvenience through too great a heat; if these temperatures appear low at first, and particularly to the simple touch, their use for some minutes is sufficient to fully demonstrate that these temperatures are sufficient and comfortable.

It is pointed out that backs of chairs or shawls of knitted electro thermic threads are very practical for warming the arms, the back, the loins of rheumatic subjects.

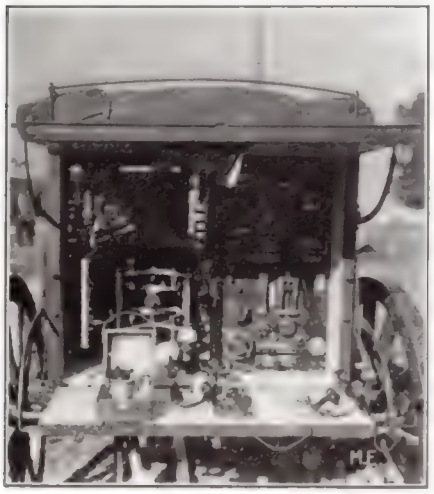
Book Review

Treatise on Wireless Telegraphy and Telephony, by C. I. Hoppough,—a book wherein the author starts at the beginning of things, so to speak, and gradually brings out the theory and practice of wireless transmission of intelligence. The book is devoted almost entirely to wireless telegraphy, a chapter on wireless telephony being added at the end. The illustrations throughout the book are nearly all taken from commercial apparatus.

While it is not free from those errors which usually appear in first editions, the book is well written, and worth reading by those interested in the art. It may be obtained from our book department at $1.50 per copy, or by mail, at $1.65.

BRITISH ARMY FIELD WIRELESS SET.

The accompanying illustration shows a British military wagon fitted with Marconi wireless apparatus. On the tailboard may be seen a Marconi wave meter, two sets of head receivers and the transmitting key. Inside the wagon to the right is the receiving apparatus, consisting of two complete Marconi tuners, one a double balanced valve tuner in which use is made of two Fleming valves



Marconi Field Wireless Set.

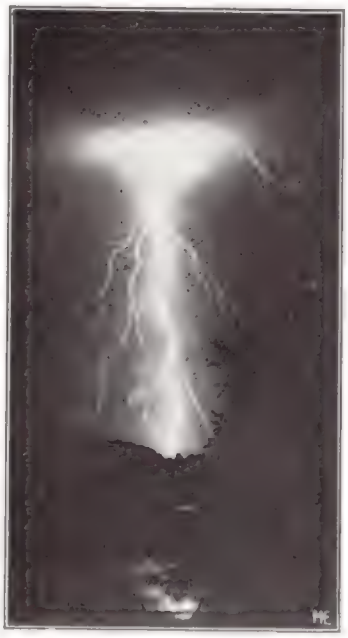
connected in opposition to each other, as described on page 870 of our March issue, the other a multiple tuner similar to the one described in our January issue, for use with the Marconi magnetic detector. The two tuners are mounted together in one box, and while the arrangement of the parts is somewhat different, a comparison of these tuners with the Marconi Multiple Tuner and Valve Receiver described in our January and February issues, will show the similarity. The sending apparatus, consisting of transformer, spark gap, aerial inductance, aerial switch, etc., is located on the left hand side.

The bamboo wireless mast may be seen projecting up beyond the wagon.

LIGHTNING FLASH.

The accompanying "lightning picture" which undoubtedly will be of interest to many of our readers, shows a bolt of lightning in a way really unknown to the average eye. The light in the foreground is a reflection of the bolt on the water.

This exposure was taken by an amateur photographer, Mr. Kurt Hantzsch, Milwaukee, Wis., at Moose Lake, Nash-



Note Main and Branch Flashes.

otah, Wis., during a heavy electrical display the early part of July.

We are able to present this picture through the courtesy of Mr. Harry Fricke, of Milwaukee, Wis.

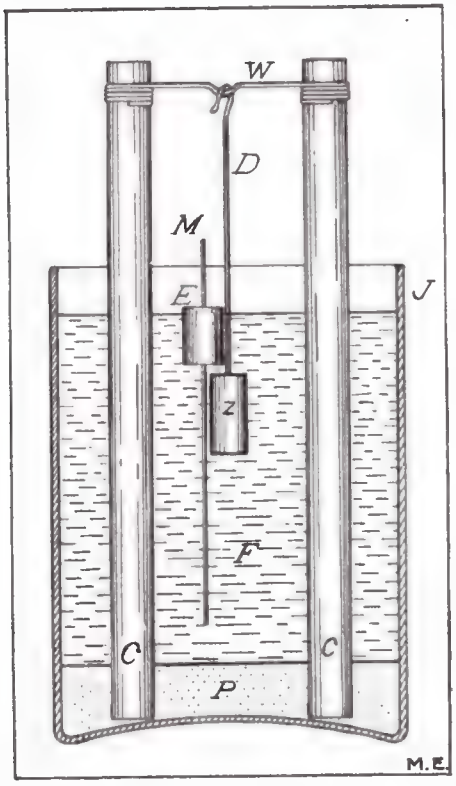
LARGE HYDRO-ELECTRIC PLANT.

The T. A. Gillespie Company, of Pittsburgh, has been awarded a contract by the West Penn Electric and Traction Company for the erection of an immense dam and power house on the Cheat River in West Virginia, near the Pennsylvania State line. The price is said to be $1,000,000. Work on the dam is to begin immediately and is to be completed by December 1, 1913. It is claimed that the plant on Cheat River will eclipse the great power plant at Niagara Falls in both magnitude and capacity. The dam will be 657 feet across and of the gravity type with a spillway crest, surmounted by a reinforced concrete bridge supported by reinforced concrete piers. It will be 80 feet high and will be 100 feet from the foundation to the floor of the bridge.

THE REVOLVING MAGNET.
AN EXPERIMENT IN ELECTRO-MAGNETIC ROTATION.

By H. B. Dailey.

AN interesting experiment demonstrating the singular natural tendency of a magnetic pole to revolve about an electrical current may be easily performed with the simple apparatus here illustrated. Two electric light carbons, C, eight inches long, are fixed upright, two inches apart within a suitable glass jar, J, by means of beeswax, P, melted and poured into the jar to a depth of about an inch. The tops of the carbons are joined by a conducting wire, W, from which is suspended a hooked copper wire, D, to whose lower end is soldered a piece of round Leclanché battery zinc, Z, ⅜ inch in diameter and 1 inch long. The jar is filled with bichromate battery fluid, F, to a height that will immerse the top of the zinc to a depth



of about 1 inch. A piece of knitting needle, M, strongly magnetized, 4½ inches long, has upon it near one of its ends a cylindrical cork float, E, half an inch in diameter. The cork should be so adjusted upon the needle that the middle of the latter shall be about opposite the middle of the zinc when floating in the liquid. To protect the needle from the corrosive action of the battery fluid the needle, with its float, should be dipped for an instant into melted beeswax or paraffin.

The arrangement constitutes a galvanic cell, the current traveling downward through the zinc hanger.

When the floating magnet is placed within the vessel, between the carbons, it immediately rushes toward the central current-bearing wire until the cork float touches the latter, when it sets up a constant lively rotation about the wire in a direction depending upon the polarity of the upper end of the magnet. By having a larger containing vessel with two zinc hangers and two floating needles, oppositely magnetized, both right and left-handed rotations can be shown at once. The diameter of the cork float should be such as will cause the magnet to easily clear the zinc in its travels about it, and since the float, in its movement about the wire must constantly roll against the latter, the float must be made as smooth and truly cylindrical as possible to insure free rotation.

WHAT IS A THUNDERBOLT?

By Dr. Leonard Keene Hirshberg.

Ball lightning or the thunderbolt, as it was called by the Greeks, is a gaseous sphere without an envelope. It contains energy which is afterwards released with explosive violence.

1. It is a luminous ball which often occurs after an intense flash of lightning.

2. As it falls, it moves slowly and horizontally some feet above the earth.

3. At sea, it is most frequent.

4. The mass of a thunderbolt is denser than air. In an air current of ether or in the neighborhood of electricity it explodes, and the explosive wave travels outwards, followed by a strong smell of ozone. Then the ball ceases to exist. It is clear that the ball is nothing but atmospheric gases, *because:*

Ozone is the only gas that is denser than air produced under electric stress.

Ball lightning travels horizontally to the negatively charged earth. That it is repelled, proves that ozone also is negatively charged. The energy liberated, causes a transition of ozone to oxygen and thus explains the explosion.

An Automobile Electric Loud Speaking Annunciator

By Frank C. Perkins.

The accompanying illustration and drawings show a new scientifically perfect loud speaking 'phone in service in an automobile as a great convenience in giving directions to the chauffeur.

It is said to be positive in action and easy to install. It is useful for limousine cars for conversing with those on the first seat and on public passenger cars to announce the streets. For hotels, trains and steamers it is of service in giving orders, or awakening occupants at appointed times, and for restaurant kitchens to receive announcements of meal orders, etc. It is claimed that the magnifier equipped

with a megaphone is useful for railroads to announce arrival and departure of trains, and in the dispatching of the latter, and for general business to make announcement and locate heads of departments.

The auristophone electric loud speaking annunciator consists mainly

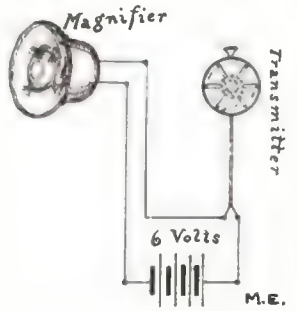
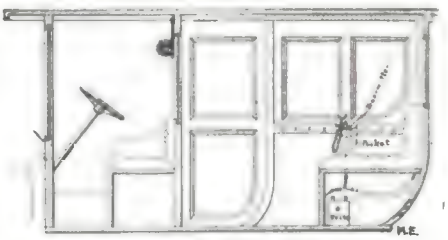


Diagram of Wiring. (for any place.) of Standard Auristophone Electric Loud Speaking Annunciator

of a voice receiving instrument or transmitter for the reception of sounds, together with a reproducer affixed to an amplifier, for the reproduction or magnification of sounds. They are connected in series with a few strands



Auristophone Electric Loud Speaking Annunciator as Installed in a Limousine Car

of wire to a battery, and appliances such as bells or buzzers are not required.

It is pointed out that this electric loud speaking annunciator enables one or more individuals to receive a message or order, without action, or labor on their part, by talking in loud, clear and audible fashion, just as one person does to another.

THE SONG OF THE AERIAL.

I'm free! I'm free!
On land and sea;
I'm monarch in every clime;
I hold my sway,
By night and day,
And laugh at the steps of Time.

I'm high, I'm tall,
Above them all,
Houses and steeples and towers;
Nought but sky
Is higher than I,
Nought but sky's blue bowers.

I guide. I rule,
The Wit, the Fool,
I temper the rich man's life:
I dog the knave,
I free the slave;
I tell the tale of the strife.
I hear, I hear,
The cry of fear,
The shipwrecked ships' despair;
I send to save
The weak, the brave,
For this is my pride and care

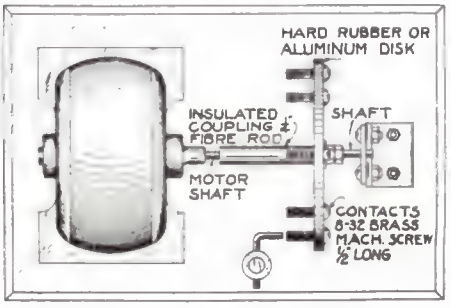
I'm Aerial Wire.
I'm higher, higher,
Higher than all things all!
Make way! Make way!
All night, all day,
Make way for the Wireless Call!

Edmund Leamy.

This department has been started with the idea to encourage the experimenter to bring out new ideas. Every reader is welcome to contribute to this department, and new ideas will be welcomed by the Editors. WHEN SENDING IN CONTRIBUTIONS IT IS NECESSARY THAT ONLY ONE SIDE OF THE SHEET IS USED. SKETCH MUST INVARIABLY BE ON A SEPARATE SHEET NOT IN THE TEXT. The description must be as short as possible. Good sketches are not required, as our art department will work out rough sketches submitted by contributors. IT IS THEREFORE NOT NECESSARY FOR CONTRIBUTORS TO SPEND MUCH TIME IN SKETCHING VARIOUS IDEAS. When sending contributions enclose return postage if manuscript is to be returned if not used. ALL CONTRIBUTIONS APPEARING IN THIS DEPARTMENT ARE PAID FOR ON PUBLICATION.

FIRST PRIZE, TWO DOLLARS
IMPROVED ROTARY SPARK GAP

This gap is of the directly connected type and can be run by any small motor. Another good point about this motor is that the speed can be varied over wide limits by inserting a series resistance.



M.E.

There is only one spark gap used, a common connection being made to the shaft of the gap proper, which is insulated from the motor shaft.

In rotary spark gaps employing two spark gaps in series, if the rotating electrodes are not spaced evenly, the spark is very ragged. Also gaps employing large electrodes give a heavy tone, which is not heard when small electrodes are used.

The disk may be constructed of 3/16-inch hard rubber or ⅛-inch aluminum and is 3½ inches diameter.

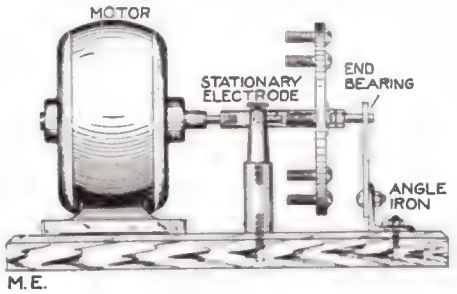
There are 8 movable electrodes made of ½-inch, 8-32 round headed, brass machine screws. If hard rubber is used for disk, these must be connected to the sub-shaft.

The sub-shaft is a piece of No. 19 brass rod 2 inches long and threaded 10-32 for ½ inch at one end. The insulated coupling is made of fibre rod ¼ inch diameter, 2½ inches long, drilled at one end to fit tightly over the motor shaft and at the other, drilled and tapped 10-32 thread for about ½ inch. The disk is clamped between the end of the coupling and a washer, by means of two nuts.

The motor must be arranged to run in a counter clockwise direction when looking at it from the disk, so as to tend to tighten these nuts.

The end bearing is made in two parts, the base being a piece of angle iron ¾ inch long and the upright, brass 3 x ½ x ⅛ inches. The arrangement of the various parts can be clearly seen from the drawing.

In using the gap, the ground side of the

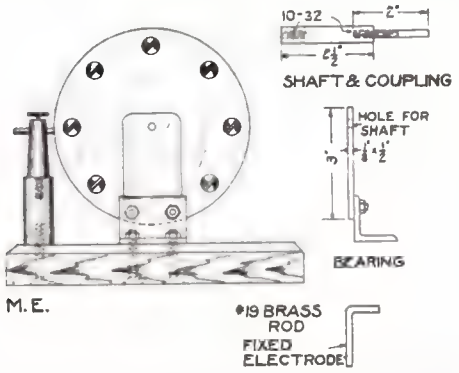


M.E.

helix must be connected to the sub-shaft, or, if an oscillation transformer is used, this shaft must be grounded. This reduces the danger of sparks jumping across from the sub-shaft to the motor.

The fixed electrode is composed of a double binding post mounted on top of a hard rubber rod and holding a piece of No. 19 brass rod bent as shown. The hole in binding post must be drilled to pass the electrode. The moving electrodes must be filed true. Final adjustment can be made by running gap at high speed and holding a file lightly against the contacts.

The writer has made a gap as described and it gives a very clear note. Another



advantage is, that the transformer voltage does not have to be so high to get a good spark.

Contributed by

H. R. SEARING.

SECOND PRIZE, ONE DOLLAR

AN INNOVATION IN MASTS.

It is generally conceded that the higher the aerial system of a wireless installation, the more extended is the working radius of that station. At least it seems to be the desire of every amateur to get his aerial up as high as possible. The following description of my mast should enable others to erect similar masts and increase the range of their apparatus. The cost of such a mast is approximately $5.00.

The mast is 75 feet high and is made of galvanized sheet iron service or gutter pipe, 3 inches in diameter and procurable in 10 foot lengths. The joints overlap 10 or 12 inches and are soldered. It is guyed every 25 feet which means three sets on this mast; the top set being fastened at the very top of the pole. Each set consists of four guys at right angles to each other; the twelve guys being fastened at four anchors each 34 feet from the base of the mast.

As the mast offers little resistance to the wind and is not heavy, heavy Marlin twine about 3/16 inch diameter was used for guying. This twine is light, strong and weatherproof, such as the telephone companies use for hanging their cables. The mast has no cross-arm at the top and is not insulated from the earth, although this could easily be done.

To erect this sort of a mast requires a man at each guy anchor and two or three to raise the mast, attach the guys, solder joints, etc. To raise the mast simply attach the top set of guys, station the four men to keep the guys taut, then raise the mast adding a 10-foot section each time and soldering the joints.

Two men can conveniently lift 100 feet of the pipe and there is no reason why it could not be raised to such a height, although the guys should be anchored farther from the base of the mast, say 75 feet. A pulley may be fastened at the top so the aerial can be raised or lowered at will, or the aerial may be fastened permanently before the

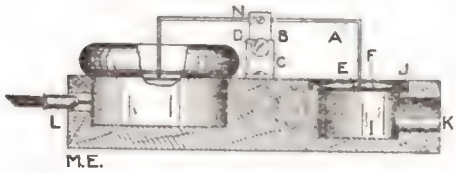
mast is raised. The accompanying picture shows the mast, simple and strong in construction and neat of appearance.

Contributed by

R. C. DENNY.

LOUD ACOUSTICAL REPRODUCTION OF WIRELESS SIGNALS BY HOME-MADE DEVICE

I have used this device with great success. The base is 1⅛ inches thick, 3¾ inches wide, and 6 inches long. With an expansion bit bore a hole to fit a wireless receiver, 1⅜ inches from one end, and bore two ¼-inch holes in the end for



the receiver cord tips. Three inches from the center of the hole for the receiver, bore another hole, 1½ inches diameter to a depth of ⅛ inch, then set the bit to 1¼ inches and drill to a depth of ⅞ inch as in I, then drill a hole K to fit a horn (E. I. Co. 3010). C is a square tube 5/16 inches outside diameter, ½ inch long and should be soldered onto a plate at bottom to attach to base and a drop of solder should be put on at top, to drill and tap for adjusting screw, D. B is a piece of ¼-inch square rod with a slot ¼ inch deep cut in at one end to receive transmitting spring wire A (No. 16 B & S), this should be bent so that both ends touch receiver diaphragm and reproducer disc, F, when B is at its highest point of adjustment. F is a mica disc, 1½ inches diameter, with a small disc of very thin sheet copper, E, fastened in its center by means of shellac. J is a spring wire circle 1⅝ inches diameter, made of No. 16 B & S wire cut so it will spring in recess in I to hold mica disc, F, in place. A should have rounded points where it comes in contact with diaphragm and disc, F. Tension adjustment can be made by pressing down on top of B, and fastening in position by means of screw D. N is a small screw fitting loosely in a hole in A, 1½ inches from each end. The slot in B should be just a little wider than the wire, A.

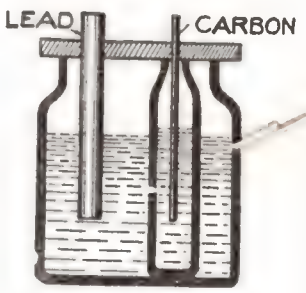
Contributed by

M. E. ARMSTRONG.

AN ELECTROLYTIC INTERRUPTER

An interrupter which makes it possible to run a small coil on 110 volts, a. c., instead of batteries, is made as follows:

Get an arc light carbon, a small lead pipe 5 inches long, a pint fruit jar, 3 ounces commercial sulphuric acid, and a bottle, preferably with square corners, which will fit in the jar with enough space between it and the jar to admit the lead pipe. Make a hole in the bottle, about 1/16 inch in diameter and 1½ inches up from the bottom, by holding bottle firmly on something, and with a three-cornered file, filing across the corner of the bottle. Keep the file wet. Next make a solution of 1 part acid to 3 parts water and fill jar and bottle, which has been put in the jar, to the same height. Suspend from a board over the top of the jar, the carbon in the bottle and the lead pipe in the space between the bottle and the jar, about 1 inch from the hole. Connections are made as per diagram. I find that with this interrupter my 1-inch coil does not heat up at all.



Contributed by

RUSSELL JENKINS.

ANOTHER ROTARY SPARK GAP

As I have seen very few articles on rotary spark gaps published in your magazine, I will attempt to describe to your readers a unique rotary spark gap

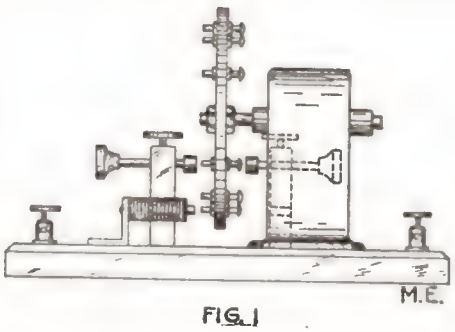


FIG. 1

with an automatic brake attachment.

The greatest difficulty the average amateur has in manufacturing a rotary gap,

is to obtain the wheel. The wheel for this gap is easily made as follows:

Procure some stiff cardboard (the more compact it is, the better), and with a compass lay out from six to eight circles, six inches in diameter. The thinner the board the more will be needed. Cut carefully along the lines with a pair of scissors. You will now have several discs which when piled up will, altogether, be from 3/16 inch to ¼ inch thick. Cover both sides of each disc (except the top and bottom one) with a good grade of carpenters' glue, and put them together so that their edges are nice and even. Now if you have access to a copying press, clamp them in this, or else put some heavy weights on them, and let them stand over night. When the glue dries you will find you have a wheel, six inches in diameter, and from 3/16 inch to ¼ inch thick, as stiff as a piece of fibre, perfectly round, and with smooth edges. Besides this you have the exact center marked by the hole your compass point made. Again, take your compass and lay out a circle 5 inches in diameter. Step around this with a pair of dividers, fifteen points (they will be a little over an inch apart), and drill holes through the wheel at these points, large enough to accommodate 8/32 inch machine screws for the plugs, which are of iron, ½ inch long. Two nuts are put on each plug, one on each side of the wheel.

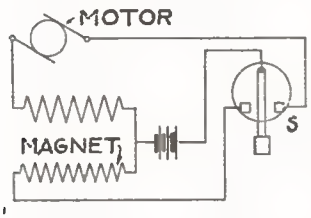


FIG. 2

A convenient way to fasten the wheel to the shaft of the motor, is to thread the shaft with a convenient sized thread, and then lock the wheel on with large nuts.

Now comes the unique part of the gap, namely, the brake attachment. It is a well-known fact that the one objectionable feature of a rotary gap, is the fact that it will run for a considerable time after the current has been shut off, and of course the noise created thereby will break up the incoming signals. This is generally overcome by muffling the gap, but this decreases efficiency. Of course, the motor could be reversed, but this is bad for the motor, consumes a large amount of current, and is apt to force the wheel off, or cause the plugs to hit. The best way to stop the motor quickly is shown clearly in the sketch. A rather powerful electro-magnet (an old bell magnet will do nicely), is placed as shown, with its core as near to the plugs as possible. Be sure when fastening it down, that when a plug is in front of it, there is also a plug between the two fixed electrodes. With the magnet arranged in this manner, your motor will not only stop quickly, but your gap will always be in condition to use as a fixed gap. This is very handy with a break-in system, where in a short distance conversation you have not time to keep starting and stopping your gap.

The wiring diagram is shown in Fig. 2. Switch "S" is a S. P. D. T. switch, such as used on automobiles, to change from the batteries to the magneto.

To start the motor, push the switch to the right. To stop push all the way over to the left until the motor is at a dead stop, then release switch to the neutral position.

I have left the making of the fixed electrode and the selection of a motor to the reader, as the shape, size and position of the fixed electrodes depend on the size and shape of the motor. In regards to the motor, let it suffice to say, that the higher the speed the better.

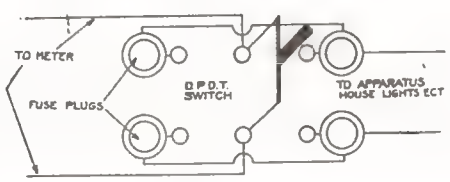
In my opinion, a rotary of this type is the best for an amateur to make, for any warp in the wheel or bend in the motor shaft can be easily taken up and rectified by adjusting the plugs.

Contributed by
GEO. W. KELLEY, JR.

RESERVE FUSE SET.

A device that is very useful when a fuse blows out when it is a great bother to get new plugs right away, is shown in the illustration.

It will be seen that two sets of plugs



are used in connection with a D. P. D. T. knife switch, so that when one set blows out all there is to do is to throw the switch to connect in the other set, and

replace the burnt-out fuses at a more convenient time.

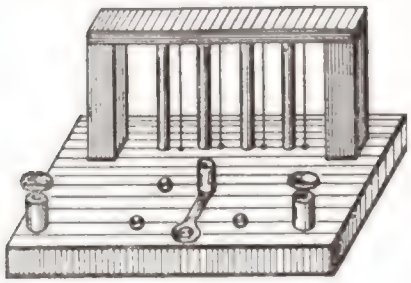
The cost of this apparatus is extremely small, while, when a fuse blows out at night, it is very convenient, besides often saving one's temper when extra plugs are not on hand.

Contributed by

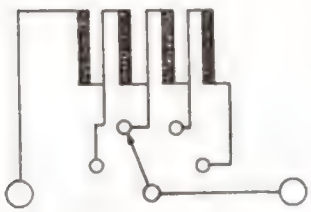
P. MERTZ.

A SIMPLE BATTERY RHEOSTAT.

The materials required for the rheostat about to be described are: Four electric light carbons, *not copperplated;* five



M.E



round-headed screws, with brass or copper washers to fit; a switch handle (if this cannot be had, a strip of sheet metal rolled up at the end will do), and two binding posts.

The base is of wood three-quarters of an inch thick. For the uprights, two pieces three-fourths of an inch square and half an inch shorter than the carbons are used. The top piece is made of thin wood, with four holes to fit the carbons in it. Other dimensions will be found in the sketch. The screws and washers are fastened to the base in a semi-circle and connected with the carbons according to the diagram.

To make better connections you can put a metal ring around the top and bottom of each stick of carbon and solder the connecting wires to these. Connect one binding post with the screw holding down the switch, and the other with the first contact screw. By moving the switch from screw to screw, the current may be varied.

Contributed by

EDWIN HALL.

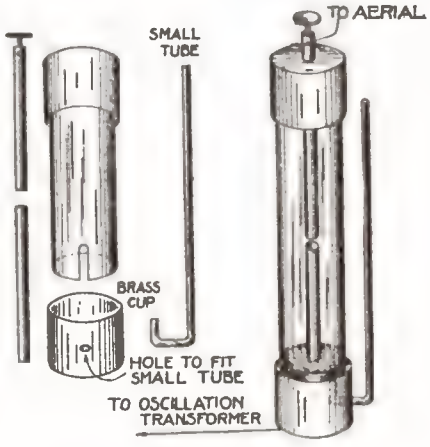
A "HOT AIR" AMMETER.

There are a great many wireless experimenters who desire to know the output of their stations, but who can not afford to construct a "hot wire" ammeter. In hunting for a suitable substitute I designed and constructed a "hot air" ammeter with very gratifying results.

The materials necessary to construct one are, a blown cartridge fuse, of about ¾ inch diameter. A glass tube about 4 inches long and just large enough to fit in the brass cups of the fuse, a piece of brass rod ¼ inch diameter, and 6 inches long, plaster-of-paris and mercury, also a small glass tube 6 inches long and with a 1/16 inch or less bore. It is very important the small tube has a bore of 1/16 or less, otherwise the instrument will be a failure.

The first thing to do is to nick the glass tube (large one) as in Fig. 1. This nick must be large enough to allow the small tube to pass through. The small tube is then heated and bent as shown at "a." This completes the glass work.

The brass ends are next removed from



M.E.

FIG. 1 FIG-2

the fuse. Holes, large enough to allow the rod to pass through, are then drilled in the ends. The rod is cut into two pieces, one of which is 2¼ inches long. This is soldered to one of the cups as

shown. A small hole just large enough to allow the small tube to pass through is then drilled in the side near the bottom. The remaining rod has one end drilled and tapped, making it into a small binding post. It is then soldered to the other brass cup. Be sure to have it project into the tube (when finished), so it will lack ⅛ inch of touching the other rod. The cups are filled about one-half full of wet plaster of Paris and placed in position. After the plaster is dry take a small glass funnel and fill with mercury until it is about ¼ inch over the small tube, inside the instrument.

As the spark jumps between the rods it heats the air and causes it to expand. The expanded air pushes down on the mercury and this causes it to rise in the small tube. As air expands evenly for every rise of 1° degree in temperature this instrument can easily and accurately be calibrated. If desired it may be mounted on a base.

Contributed by

HAROLD L. KESSLER.

A JOY RIDE DISCOURAGER.

A friend of mine who keeps his auto in a public garage was desirous of overcoming the "mysterious disappearance"

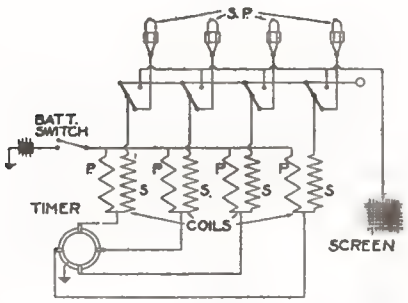


FIG. 1

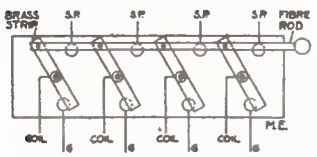


FIG 2

of gasoline, also additional mileage on his speedometer, which he could not account for. The matter was put up to me and I hit upon the following idea, which can be used on any car using coils of the vibrating type. Fig. 1 shows the usual method of wiring four coils, with an additional switch and wire which is to divert the secondary current from the spark plugs to a piece of wire screen which is under the car and which can be raised or lowered to the ground at will by means of a short string conveniently situated. Fig. 2 gives the details of the switch, there are no dimensions given, as the switch is placed under the coil box on the dash and as coil boxes vary the switch can be made accordingly.

Let me state here that after the switch is assembled it is a good plan to enclose the working parts with a cover so that the whole will give the appearance of an innocent piece of wood with a little fibre rod sticking out one end. Of course, in wiring, extreme caution must be taken, due to the nature of the current, the wire running from the switch to the ground screen should be secondary cable, and protected with rubber sleeves, where necessary, to avoid short circuits. Now the car is in the garage and some one (not yourself or other close relation) is going to use your car; so a cotter pin or nail is stuck in the battery switch, instead of a switch plug, and the would be joy rider goes to crank the car and, just when the timer completes the circuit on the primary there is another circuit completed from the starting crank to the floor, which is usually enough for the joy rider. The shock is nasty but not harmful and a device of this kind is effective in preventing stolen cars.

Contributed by

EDWARD W. HUTCHINSON.

INSTRUMENT LACQUER

While looking over some of your *Modern Electrics* I saw an article about making a good lacquer; but as I did not understand how much alum to dissolve, I made use of the following good lacquer, which every amateur can get. Procure some banana oil from any paint store for about five cents. With a small brush paint over the article with the lacquer, and let it dry thoroughly before handling.

Contributed by

SAMUEL COHEN.

ANOTHER AERIAL GROUNDING SWITCH.

In your August number appeared an article on "A Self Grounding Aerial Switch," by Gilbert Walker. I think his contribution could be improved upon by making the switch a double throw as in the illustration. In this way the experimenter will not be bothered by so many joints and the aerial will be grounded when the instruments are not in use. The handle and lever of the switch should be removed and another piece of metal, cut

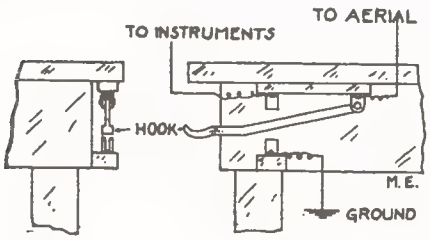


FIG. 2 FIG. 1

as shown, substituted. If desired the handle alone may be removed, and a piece of metal fastened by riveting to the switch lever.

Fig. 2 shows the details of additional contact. If possible the experimenter should use heavy contacts and bars.

Contributed by

JAMES STEIN, JR.

Note.—In this and the article referred to, sight is lost of the requirements of the National Board of Fire Underwriters, as detailed in our June issue. These makeshift devices should not be used to avoid compliance with the Underwriters' rules.—Ed.

REGARDING GROUNDING SWITCHES.

A short time ago, while experimenting, I connected the aerial and ground to the two terminals of my ½-kw. transformer, with a spark gap across them.

I was very much surprised to find that I could not get a spark at the gap. On investigating, I found that the aerial was grounded through the asbestos wood base of the ground switch, which, of course, short circuited the transformer. I left the current on for about 5 minutes and the portion of the base of the switch around the two outside contacts burnt out leaving a white ash.

Ever since the switch was installed a decrease in working range had been noticed and perhaps the same trouble exists in other amateur stations.

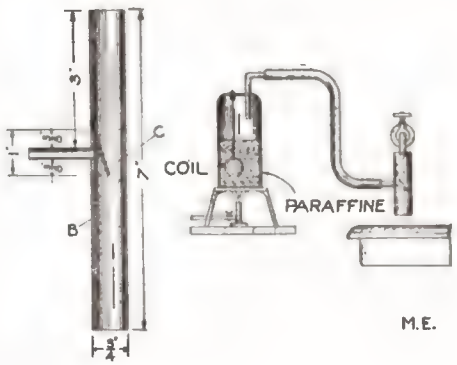
Contributed by

H. R. SEARING.

AN ASPIRATOR.

There are many amateurs who build spark coils and transformers and do not impregnate the secondaries in paraffine or any other insulating compound, thereby causing faulty insulation; and those who do use paraffine use no pump to exhaust the air from the vessel in which the work is being done, because pumps to do such work are expensive, and beyond the means of most amateurs. The following aspirator answers the purpose of the pump very well.

In the diagram which explains itself fairly well, the partition, c, is fitted to the tube, B, (which is made of brass) in a



hacksaw slot and half way fills the tube. The rest is apparent from the sketch.

Contributed by

J. L. HENDERSON.

WIRELESS HINTS.

If a weight is attached to the end of the pulley rope when raising a wireless mast the rope will serve as a plumb line by which to brace the mast straight.

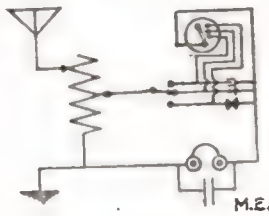
The white of an egg is an excellent material for pasting tinfoil on glass plate sending condensers.

A strip of clock spring pressing against the inside coating of leyden jar sending condensers will insure a good connection, thus preventing the usual loss through brush discharge at this point.

A very efficient buzzer detector test may be made by securing a binding post

having a small nail through the hole in its middle to the base of an electric bell (minus its gong), just to the left of the vibrator adjustment screw. When the nail is regulated against the hammer arm and set so that the vibrator barely moves, a sound like that of a "singing spark," will be heard in the receivers when the vibrator contact is grounded. This gives a very good test.

A switch as shown in the accompanying drawing may be used with good re-



sults to short circuit any number of detectors and thus retain their adjustment while sending. It consists of an ordinary one point switch having as many points added as shown, as there are extra detectors. If many points are to be added extra long switch arms may be obtained from the E. I. Co. The sketch shows the connections of the detector circuit.

Contributed by

JOHN B. BRADY.

DETECTOR SWITCHBOARD.

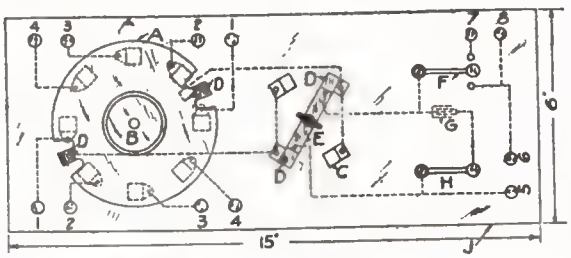
I enclosed sketch of an entirely original idea I believe, having made and used same in my wireless station about a year.

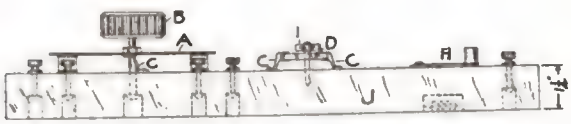
Description: Select a piece of oak about sixteen inches by six inches, one and a quarter inches thick and dress down. This board is to contain an auto-short circuiting selective switch A, actuated by Electrose knob B.

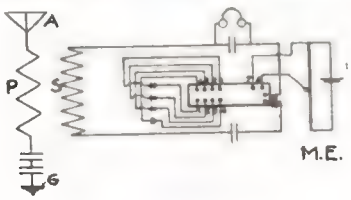
A is a piece of sheet brass, 1/32 inch in thickness by 5 inches in diameter. As shown in sketch this brass disk has two tongues or insulated contacts on opposite sides.

Each tongue is wrapped with a piece of insulating tape, then a piece of thin brass strip is formed over this with terminals thereon, which will make contact with spring contacts, C, which correspond to the terminals of four different detectors through binding posts 1, 2, 3 and 4. This switch rotates by turning the knob, B, so as to bring tongue contacts over respective detector contacts. When it is moved so as to put insulated contacts between spring contacts all detectors are short-circuited automatically, thereby protecting the detectors, to some extent, from the effect of the sending spark.

Next to it is the current reversing switch, sometimes used in wireless, which is self-explanatory, D, insulated contacts, E, hard rubber, I, knob. C, spring contacts, connections are shown by dotted lines.







Next is shown a condenser, G, made up of a roll of tinfoil and paraffined paper, 1 foot long and set in base with its shortening switch. This we find useful with some detectors. Also, next to it, F, is the potentiometer cut-in switch with terminals, 7 and 8, leading to potentiometer. Terminals, 5 and 6, are connected to the secondary circuit of the loose coupler as per diagram.

RAY J. BUTTON.

ONLY ONE WAY.

"Do you think it is possible to make an airship absolutely safe?"

"Sure," replied the mechanician.

"How?"

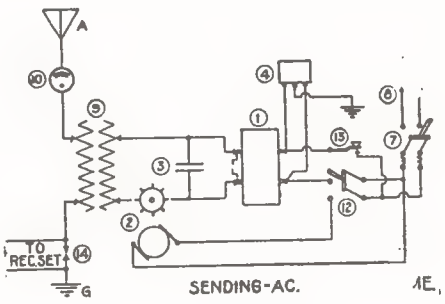
"Disable it before it gets a chance to leave the ground."—*Washington Star.*

This Month's Supplement

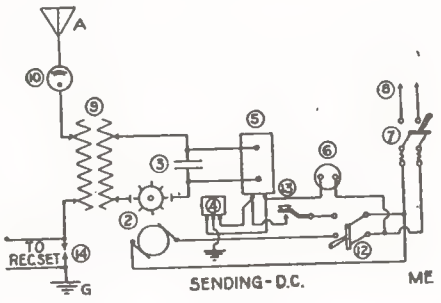
A MODERN AMATEUR WIRELESS STATION

THE wireless amateur should realize, if he does not already, that the simpler his outfit is the better it will work. This of course is not intended to mean that he should eliminate any piece of apparatus that will contribute to the efficiency of his set; but he should get rid of, or better, not purchase unnecessary apparatus, and should not try to devise complicated hook-ups just for the sake of having all his apparatus connected up so he can use any part or all of it once. It is with this idea in mind that we feel impelled to describe and illustrate what we consider an up-to-date and efficient outfit.

The Sending Set.—Where alternating current is available it should be used as the power supply, and all the 110-volt wiring, or as much of it as possible, should be run in either rigid or flexible metal conduit. The former is preferable as it makes a neater job. The power circuit, whether it be A. C. or D. C. should be connected through a 25-ampere fused DPST switch, through one side of a 25-ampere DPST switch, not fused, the sending key, and the primary of the transformer. The kick back preventer should be connected directly to the primary terminals of the transformer, and to a ground wire separate from the main ground wire. Where the supply is A. C., this is all there is to the power circuit to the transformer. Where the supply is D. C., an electrolytic interrupter or some form of mechanical interrupter, such as a mercury turbine, will have to be connected in series with the primary of the transformer. Where the current is A. C. the transformer should be of the closed core, magnetic leakage type, as this type has all the advantages of the open core transformer, besides being more efficient. It should, preferably, be adjustable as to output in order that just enough energy be delivered to the aerial to carry the message, and therefore cause as little interference as possible. Where the current is D. C., we have no choice, but must use the open core transformer, in connection with some form of interrupter, as previously mentioned. The sending key should have heavy silver or platinum contacts at least ⅛ inch in diameter, and the spring should be stiff enough to insure a sharp break when the key lifts, in order to avoid burning and sticking of the contacts. This is especially important where the open core transformer is used with D. C. The sending condenser should be built in units so as to be adjustable, and should be so constructed as to eliminate, as far as possible, all brush discharges from the edges of the plates. The spark gap should be of either the rotary or quenched types. The former possesses nearly all the good points of the latter, and costs less. The motor should be wired to the power supply through the other side of the second 25-ampere DPST switch mentioned above. This switch, which should be mounted beside the sending key, is used as a matter of safety. You can't get an accidental shock from the secondary of the transformer when the spark gap is not running. When the latter is running it serves as a warning to the operator to keep away from the secondary circuit. Also, should the key stick, opening this switch cuts off the power. When the rotary gap is used with the open core



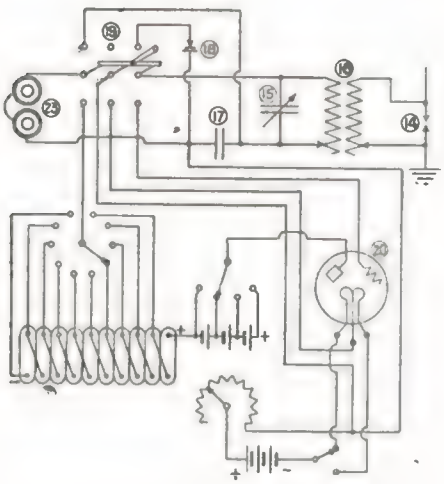
transformer on D. C., the fixed electrodes should be wide enough to bridge the distance between two of the plugs on the disc, as the gap will not give a musical note anyway, and if they are not wide enough to do this the spark will be ragged and irregular. The connections of the transformer secondary, sending condenser, and spark gap are the same, whether the transformer is of the closed core type operated on A. C., or the open core type operated on D. C. The oscillation transformer is the one shown in the supplement to our June issue, and is used in preference to a helix because a pure, sharply tuned wave, not possible with a helix, may be sent out. The hot wire ammeter and the Electrose lead—in insulator with the aerial and ground leads,



complete the sending equipment. The aerial and ground leads, and the wiring between the sending condenser, spark gap, and the primary of the oscillation transformer should be flexible copper conductors, the larger the better.

The Receiving Set.—This should be loose coupled, and arranged on the break-in system. This latter is accomplished in the simplest manner by connecting the primary of

the loose coupler directly to the terminals of a knife-edged anchor gap in the ground lead. This gap should have an opening between the electrodes of only a few thousandths of an inch, or the thickness of a sheet of very thin paper. This scheme has the advantage of simplicity over systems employing a lot of extra contacts on the key, and the further advantage that you can not only hear a station when the key is up, but you can hear a commercial station within five or ten miles when the key is down. Some of our readers may doubt this, but the writer of this article knows it to be a fact, for he has listened in at a station so equipped, in Brooklyn, and heard NY and TWT in New York City while the key was down and the transmitter in operation. The set should comprise: a loose coupler with the primary and secondary windings variable, one variable condenser, one fixed condenser (adjustable), mineral detector, and an audion, with the necessary switches, rheostat, batteries, and a pair of high grade head receivers. For very short waves, a variable condenser, and for long waves beyond the capacity of the loose coupler, a loading coil, may be connected in series with the primary of the loose coupler. The switches and rheostat for controlling the



RECEIVING ME.

lamp and telephone batteries for the audion may best be placed on a small battery switchboard on the wall, while the switch for changing from one detector to the other should be mounted on the table, near the detectors. This switch at the same time switches the receivers, and also cuts off the lamp battery when the mineral detector is in use. The mineral detector is provided to save the audion for the real long distance work, at which no other detector can beat it. In the mineral detector, silicon gives good results, and is recommended. Should the operator experience any difficulty in maintaining the detector adjustment using this break-in system he has only to open the detector switch, 19, while sending. The audion requires two sets of batteries, one for the lamp filament, and the other for the telephone receiver circuit. The lamp battery may consist of three dry cells connected in series with the rheostat. The telephone battery may consist of ten small three-cell vest pocket flash lamp batteries connected to the ten-point switch, and three single dry cells connected to the four-point switch. This arrangement gives a variation of from 1½ to about 40 volts in steps of about 1½ volts, which is sufficiently close regulation for the telephone battery. This adjustability of the telephone and lamp batteries is necessary for the reason that no two audions are alike, and they require from 2 to 4 volts in the lamp battery, and from about 15 to 40 in the telephone battery. However, when the adjustment is once made it does not have to be changed. The hook-ups are shown in the diagrams herewith, and the layout of the apparatus, in the supplement to this number of the magazine. Both A. C. and D. C. transmitting apparatus are shown in the supplement, but of course, only one or the other would be used.

The Aerial.—This may consist of 4 or 6 stranded conductors, each composed of 7 No. 20 or 22 B & S hard drawn copper or phosphor-bronze wires, strung between two spreaders 70 feet apart and 60 feet high, the spacing of the wires being 3 feet. No insulators between the wires and the spreaders are necessary if electrose or other equally good high tension insulators are inserted between the spreader bridles and the ropes used to pull the aerial up to the top of the poles. The lead-in may be connected either at the end or the middle of the flat top and should be composed of a conductor of the same material as is used in the top for each of the aerial wires, brought down and bunched together at the lightning switch just outside the window. The lightning switch and the lightning ground wire should be installed on the outside of the building as required by the Underwriters. All the power wiring and apparatus should be installed in accordance with the Underwriters' Rules. The whole outfit, including the aerial, should be inspected by them, and their certificate secured. Then there will be no trouble with the insurance company over payment of the policy if a fire occurs in the same building with the station.

The dimensions given for the aerial are about as great as may be used and still keep within the 200 metre sending wave length requirement of the Alexander Bill. If a larger, separate aerial is erected for receiving only, it should have a separate lead-in, lead-in insulator, and ground lead. The anchor gap, 14, should then be placed in the ground lead of the receiving aerial and the loose coupler connected to it as before. The flat tops of the two aerials should lie in directions at right angles to each other, in order to reduce as much as possible the absorption, by the receiving aerial, of the energy in the sending aerial.

A 50-Watt Step-Down Transformer

By Don Beach

This transformer is for use on 110 volts, 60 cycles and will furnish 10 volts and 5 amperes, or 5 volts and 10 amperes from the secondary. This type is known as the "Ferranti"type transformer and its ease of construction and high efficiency commend it to the amateur.

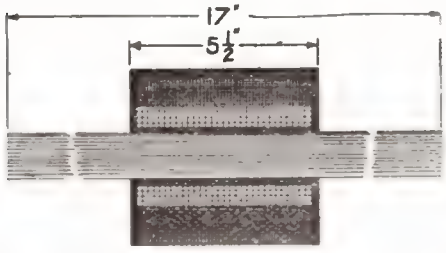
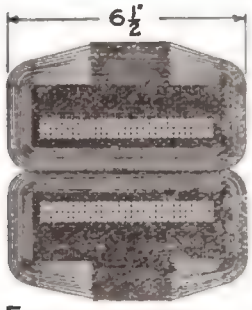


FIG. 1

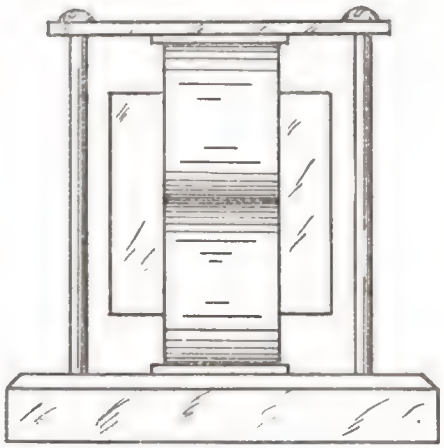


M.E. FIG. 2

The process of construction will be taken up step by step to give the builder a better insight into its make-up; first comes the

Core.—Procure 3 pounds of transformer or sheet iron (about No. 28 gauge), cut into pieces 17 inches long and ¾ inch wide. After the strips are annealed and shellacked they are laid in a pile 17 inches long and ¾ inch square. For 5½ inches in the middle the core is wrapped with a 1/16 inch thickness of empire cloth or fibre and 2 coil ends of ¼ inch fibre, 2¼ inches square are slipped over the core, and fastened with shellac to the ends of the insulation. The insulation should fit the core tightly or else the core will make a humming noise. We now have a winding space 5 inches long and ¾ inch deep all around. In this space we put the

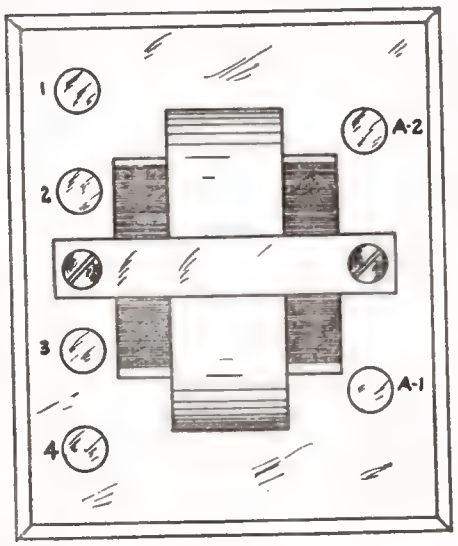
Winding.—The secondary is wrapped next to the core, and consists of about 1½ pounds of No. 13 B. & S., D. C. C. copper wire. There are 4 layers of 56 turns each, making in all 224 turns of No. 13 wire. Beginning at the left the operator passes about 10 inches of wire through a hole in the flange and then winds on 2 layers; a loop is left out for connection and the last 2 layers are wound on and the end passed through the third hole in the flange. Shellac and paper should be used between the layers, and the whole secondary should be covered by shellacked paper. The primary is next wound over the secondary and consists of about 2 pounds of No. 23 B. & S., D. C. C. copper wire. There are 16 layers in the primary, with 153 turns to the layer, making in all 2,448 turns of No. 23 wire. The winding is wound in the same direction as the secondary and no break is made in the wire. The whole winding should be covered by a few turns of paper and a piece of imitation leather. Our coil should look like Fig. 1. The next step is to take half the sheet iron strips and bend them back over the coil so that they will overlap. The same is



M.E. FIG-3

done with the other half of the core with the remaining strips (Fig. 2 will make this clear). The coil is next clamped to the base by a wood bar and 2 bolts. The bolts should be 5 inches in length, and the bar should be of oak or other hard

wood. The base is made to suit the builder, but it should be made of slate, marble or soapstone. Fig. 3 shows this construction. Our next step is to bring out our taps. The primary taps go to A 1 and A 2, Fig. 4, and the 110 volt leads go to these taps. The beginning of the first layer of the secondary goes to post 1. Next cut the loop and tap the end of the second layer to post 2, the beginning of the third layer to post 3, and the end of the fourth to post 4. Our transformer is now finished and we are ready for business. By connecting 2 and 3, 10 volts 5 amperes may be taken from 1 and 4



M. E.

FIG. 4

or 5 volts, 10 amperes may be taken for a very short time from 1 and 2. This transformer takes about as much current as a 16-c.p. light and may be used to run induction coils or for lighting the Christmas tree or for many things where little presure is required. Connect 1 and 3 and 2 and 4 for 5 volts, 10 amperes steady.

Contributed by

DON BEACH.

ELECTRO-PLATING ON ALUMINUM

By Samuel Wein

The electro-deposition of various metals upon aluminum presents many difficulties which are chiefly due to the behavior of aluminum towards the plating bath. The deposits to be sure are formed, but they possess no adherence, and especially baths containing potassium cyanide yield the worst result in consequence of the effect of alkaline solutions upon the base metal.

There has been much experimenting done along this line of electro-depositing. The best and most reliable process is without doubt the method patented, in 1893, by Prof. Nees. It consists in first immersing the aluminum articles, previously freed from grease, in caustic soda lye until the action of the lye upon the metal is recognized, gas bubbles rising to the surface. The articles, without being previously rinsed, are then immersed for a few minutes in a solution of chloride of mercury, rinsed, again brought into the caustic soda lye, and then, without rinsing, suspended in the silver bath. The deposit of silver thus obtained adheres very firmly and can be scratch-brushed and polished with the steel without raising up. It can also be directly gilded, brassed, or, after previous coppering, in the potassium cyanide-copper bath, provided with a heavy deposit of nickel, and polished upon buffing wheels.

Burgess and Hambuechen* found it best to first zinc the aluminum, in an acid zinc bath, containing one per cent. fluoric acid. The fluoric acid acts as a solvent for the film of oxide formed, so that the deposit is effected upon a pure metallic surface. According to these authors the aluminum article should be immersed in dilute fluoric acid until its surface appears slightly rough and attacked. It is then rinsed in water, and, for a few seconds, immersed in a bath of sulphuric acid 100 parts and nitric acid 75 parts. It is then again thoroughly rinsed in water, next placed in a zinc bath of 15 deg. Bé., consisting of zinc sulphate and aluminum sulphate and acidulated with one per cent. of fluoric acid or the equivalent quantity of potassium fluoride, and zinced for 15 to 20 minutes. For subsequently silvering or gilding, the zinc deposit is first copper plated in the potassium cyanide copper bath.

The writer proposes first to provide the aluminum, in readily fusible metallic salts (cupric chloride, tin salt), with a coating of these metals, and then treat it further in aqueous electrolytes.

*Electro-Chemistry Industry, 1904, No. 3.

Simple Experiments in Chemistry

By Philip Edelman

6. Chlorine Experiments.

CHLORINE is a very active greenish yellow gas. Because of its activity it is not found free, but exists in combinations with other elements. Common *salt* is one of the most important of these combinations, the compound containing equal parts of chlorine and sodium. Sodium chloride (salt) can be decomposed by electricity and the chlorine obtained by electrolysis. Electricity has come to be of great importance to the chemical industries and this preparation of chlorine electrically is only one example of its use. The gas itself is 2½ times as heavy as air, is soluble in water, and has a very disagreeable odor. For the latter reason, it is desirable to avoid breathing chlorine when experimenting with this gas. In case the gas is found to be very irritating, a piece of cloth soaked in alcohol and held to the nostrils will be found to be a remedy.

Experiment.—Set up a chlorine generator as indicated in Fig. 1. The materials used are manganese dioxide and hydrochloric acid. The acid should be poured over the dioxide by means of the thistle tube. A compound known as bleaching powder can also be used as a source of chlorine. The chlorine is obtained by pouring an acid over the powder in an apparatus similar to the one just mentioned. Collect several bottles of the gas and cover them. If the cover is greased with vaseline the gas will stay in the bottle a much longer time. The gas is collected by downward displacement.

Chlorine gas is not combustible and will not burn in air. It is a good supporter of combustion for some materials, and a few materials will burst into flame as soon as they come into contact with the gas.

Experiment.—Obtain some powdered antimony and sprinkle a little into the gas in one bottle. Repeat, using another bottle and powdered arsenic. In case these metallic powders are not available, some fine iron filings may be substituted. It will be necessary to heat the iron filings before putting them into the bottle of chlorine. Sometimes, copper foil or other metallic foils can be heated and then made to burn in a bottle of chlorine.

Experiment.—Set up the hydrogen apparatus used in part 2 for the singing flame experiment. Light the hydrogen jet and then insert it into a bottle of chlorine. The jet will burn in the chlorine and a white cloud of hydrochloric acid will form.

Experiment.—Try to burn a candle in a bottle of chlorine.

Experiment.—Put a piece of glowing charcoal into a bottle of chlorine. It should go out. Chlorine does not combine with carbon.

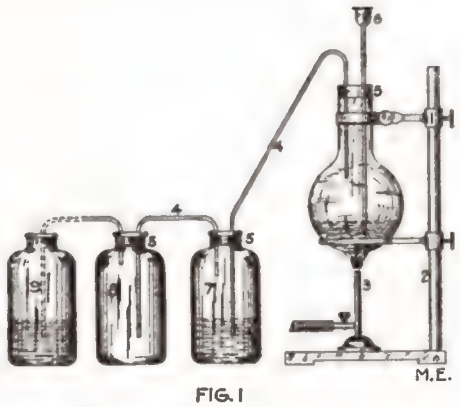


FIG. 1

1—Manganese dioxide and hydrochloric acid in flask. 2—Stand. 3—Burner. 4—Delivery tube. 5—Two-hole cork. 6—Thistle tube. 7—Dilute sulphuric acid to purify the gas. 8—The gas is collected in this bottle. When full put another one in its place. 9—Open bottle with ammonia water to prevent chlorine escaping into the air. 7 and 9 may be omitted.

Experiment.—Heat a little turpentine in a dish and soak a piece of filter paper in the warm liquid. Put the saturated paper into a bottle of chlorine, with care. Flame and smoke will result. The action is due to the attraction of the chlorine for the hydrogen to form hydrochloric acid, and occurs violently.

Experiment.—Write a word or two on a scrap of paper with ordinary ink. Moisten the paper and insert it into a bottle of chlorine. The ink will disappear. This illustrates the bleaching power of chlorine.

This property of chlorine is utilized on a large scale in the bleaching industries.

A compound called bleaching powder is generally used for bleaching purposes. It is a yellowish white powder and is often called chloride of lime. It would be well to obtain some of it (it is a common household article and is sold at most grocers and druggists) and try a few experiments.

Experiments.—Expose a little of the powder to the air for some little time. Its peculiar chlorine odor will disappear, or become much weaker, indicating the loss of its chlorine, and the powder will absorb water and carbon dioxide from the air. If left to stand long enough it becomes lumpy. As mentioned before, acids liberate the chlorine from the compound.

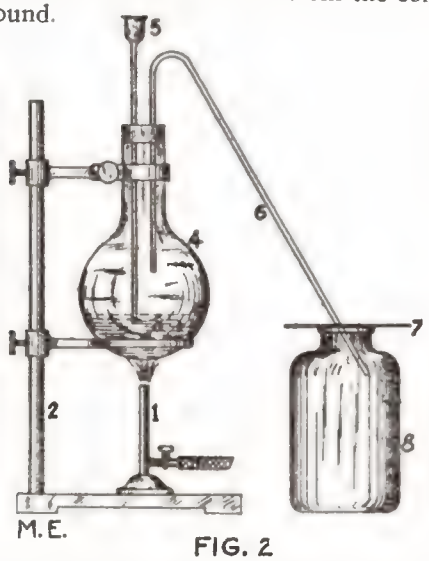


FIG. 2

1—Burner. 2—Stand. 3—Flask with salt and sulphuric acid. 4—Flask. 5—Thistle tube. 6—Delivery tube. 7—Paper cover. 8—Bottle for collecting gas.

Experiment.—A fairly good ink eraser can be made by using a mixture of bleaching powder and acetic acid. The solution should be filtered, and kept in a stoppered bottle. It will remove most of the ordinary inks from paper when applied with a blotting paper, but the erased portion discolors with time.

The bleaching power of chlorine depends upon the fact that oxygen is liberated by the chlorine. The liberated oxygen then becomes the active bleaching agent which attacks coloring matter and renders it colorless.

Chlorine is readily liquefied and is stored under pressure in lead lined cylinders and sold to the trade.

Bleaching powder can also be used to advantage as a deodorizer and disinfectant.

Chlorine combines with many metals to form chlorides. As has already been shown by the hydrogen jet experiment, chlorine forms hydrochloric acid with hydrogen. We shall now experiment with this compound of chlorine.

HYDROCHLORIC ACID EXPERIMENTS.

Ordinarily hydrochloric acid is considered as a solution; but, as has already been seen, it is in reality a gas. The solution, which is sometimes called muriatic acid, depends upon the solubility of the gas in water. Hydrochloric acid occurs in nature in volcanic gases and, to some extent, in the human system. (The gastric juice in the stomach contains some hydrochloric acid). It is manufactured on a very large scale by heating a mixture of common salt (sodium chloride) and sulphuric acid. The resulting gas is then absorbed in water.

From the hydrogen jet experiment it appeared that the gas was white and visible. This is not true, however, the white clouds being due to fumes.

Experiment.—Set up a generator as shown in Fig. 2. Put about a handful of rock or table salt in the flask and add diluted sulphuric acid by means of the thistle tube. The gas is slightly heavier than air and can be collected by downward displacement. The bottle in which the gas is collected should be covered with paper.

Experiment.—Blow up under the paper cover. The fumes indicate when the bottle is full. The fumes are minute drops of the solution of the gas in the water from the breath or the air. The gas is disagreeable and should not be breathed. If litmus water, or a strip of blue litmus paper be put into the bottle it turns red as in the case of other acids.

Experiments.—Allow the delivery tube of the generator to dip into a vessel of water. The bubbles of the gas will not reach the surface of the water on account of the solubility of the gas. The fountain experiment as described for use with ammonia gas in part 5 can be repeated with hydrochloric acid gas in much the same manner, using blue litmus water instead of red. As in the case

of ammonia the action is due to the solubility of the gas in water.

It would be well to obtain some prepared solution of the acid for the following experiments.

Experiments.—Drop a piece of zinc into a test tube containing a little of the acid. The action is due to the liberation of hydrogen. The resulting solution can be used as a soldering flux.

Experiment.—Hydrochloric acid liberates chlorine when heated with manganese dioxide. This fact has already been used in the preparation of chlorine. The test for chlorine is the blackening of iodo-starch paper. Since iodo-starch is useful, its preparation is described below:

1. Boil a little common starch in a test tube containing a little water until the starch dissolves.

2. Prepare a solution of potassium iodide in distilled water. This is done by dissolving a few crystals in the water. One-half a test tube of the solution will be sufficient. Potassium iodide can be obtained in small quantities from dealers handling photographic supplies.

Mix 1 and 2, and heat. The paper is prepared by soaking filter paper in the solution as needed. It may also be remarked that iodo-starch paper is very sensitive to electrical currents. It can be used to indicate battery currents, for finding the polarity of unknown wires, and for chemical telegraph records.

Experiment.—Silver nitrate in solution is precipitated by the addition of hydrochloric acid. The silver nitrate is prepared by dissolving a few crystals of silver nitrate in distilled water. Silver nitrate solution will also form precipitates with common salt and other chlorides. This is a valuable test.

The best grade of hydrochloric acid which is sold in solution form contains about 42 per cent. of the acid by weight. It is very useful for a wide variety of purposes. It is not very stable, and is unsuited to electric batteries and similar uses for this reason.

In handling hydrochloric acid, as well as other acids, care should be taken to avoid spattering any on the skin or clothes. Yellow stains on the hands are particularly undesirable, and remain for some time.

* Copyright, 1912, by Philip Edelman.

REMOVING OXYGEN FROM INCANDESCENT LAMP BULBS.

By Robert Grimshaw.

In making a vacuum in the bulbs for incandescent electric lamps, it is especially necessary to remove the oxygen, as the nitrogen and carbonic acid would have no bad influence on the life of the filament. Blowing them through with hydrogen has no effect worth mentioning for the reason that the oxygen seems to cling to the surface of the glass and the filaments; further, the hydrogen is not always free from uncombined oxygen.

Malignani's process uses phosphorus vapor with good effects where the filaments consist of carbon; it is not, however, practicable for the large receptacles used, in the manufacture or treatment of the filaments; and warm receptacles will not be freed from oxygen thereby; as this process does not act by combustion, but principally by reason of the porosity of the amorphous phosphorus, which absorbs all gases present—nitrogen, hydrogen, oxygen, water vapor, etc., as well as the oxygen.

A new process, patented in Germany, and which is claimed to remove even the last faint traces of oxygen, is based on the combustion of phosphorus to oxides. When in an evacuated receptacle a phosphor-halogen gas (as for instance, phosphorus trichloride), and hydrogen, are admitted by simply opening two cocks, and the mixture is ignited by an electric spark, or still better by an incandescent wire; the halogen compound will be decomposed by the hydrogen, and the phosphorus which is set free in the nascent state will combine with any oxygen that may be present. When the gases are used in the proper proportions, the oxygen may be removed from quite large receptacles. It is best to admit first the phosphor-halogen, then the hydrogen.

The resulting new compound may be used for any desired purpose for which it is suitable.

ELECTRICALLY OPERATED AUTOMOBILE FACTORY.

We are informed that there is shortly to be established in Pittsburg an automobile factory, all the machinery of which will be motor driven, the current for the motors being furnished by the local lighting company. This plant will turn out the Duquesne car.

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VOL. 3X. 7TEMBER No. 7/16.

Idiotorial

SOME boob from Washington, D. C., amazes us by writing us a long letter in which he deplores the fact quite tearfully that

THE EDITOR

this illustrious sheet is quite nice as far as it goes to cover two perfectly good pages of paper with some type and a fair quality of ink, but that we should henceforth use *italics* for all "jokes," so that a poor, overworked public would know when to laugh and when not to laugh, which, of course, is a rather funny suggestion, as the editor of the "Wireless Screech" never had intended to make the paper a funny sheet, as, for instance, our neighbor, "Lying Sharks," and for this reason the criticism is absolutely uncalled for, being that the editor works overtime every night with the selfsole intention to keep the sheet from being funny, unless, of course,, people with a perverted sense of humor (?) from Wash., D. C., can see jokes in sad facts which in reality should be taken seriously with a grain of salt to stimulate them to higher ambitions in the new art, but as it is a well-known fact that the prophet is never recognized in his own country, the editor has to bear the martyrdom as well as he can, and go on working as faithfully as he can, depending on posterity to set up for him the marble bust in the Hall of Fame, which he so well deserves for his invaluable services rendered to the world at large.

The Praktikel Electrician

CHAPTER III.

FIRST PARAGRAPH.

ELECTRICAL LAWS.

LIKE other branches of physics, electricity has its own laws, from which reductions must be made. While it is true that electrical laws are somewhat more complicated, as, for instance, mechanical laws, it must not be forgotten that electricity branches out in many directions, as the electrical art proper is vastly greater than other physical branches.

The praktikel electrician, if he would be worth the name, must master these fundamental laws if he ever hopes to become successful in his wonderful calling. Therefore, the sooner he has mastered these important laws, the sooner he will find himself qualified to solve the many puzzling problems that will be presented to him every day.

1. OHM'S LAW.

The shock imparted to a live individual which propels his body at right angles from a live conductor is inversely proportional to the weight of the individual.

From this we deduct that:

The further a live individual is to be propelled from a live conductor, the stronger the current must be.

Also:

The weight of the individual and the strength of the current are inversely proportional to each other.

2. JOULE'S LAW.

The more current you put through a conductor the quicker you will burn your hands.

Therefore:

The smaller the cross section of the wire, and the higher the current, the nastier the resulting burn.

When a conductor is filled over and above its capacity with electricity, it bursts like an automobile tire, with more or less noise and smell. This is termed *"Short Circuit."*

From above, the following highly important law has been evolved:

The louder the short circuit, the further a live individual will run away. The amount of the noise and flash is directly proportioned to the distance the live individual will run in a given case.

From the above law, it is evident that:

The more short circuits a live individual occasions, the less of them he will engineer thereafter.

From the above, it also necessarily follows that:

The amount of swearing belched forth by a live individual is directly proportional to the magnitude of the short circuit.

3. AMPERE'S LAW.

The more current you take from "behind" the meter, the quicker the company will have you arrested.

From this, the following law has been worked out:

The stronger the magnet which you place on, or near, the meter, the less your monthly bill.

In connection with above law, it is well to remember the eleventh commandment: "Don't let them catch you at it."

The following law, in respect to

the foregoing, is, therefore, self-evident:

The cleverer you tap the company's mains, the smaller the chance of your being found out.

(TO BE CONTINUED.)

CONSTANT K

By Samuel Wein.

AT a recent meeting of the Fourth Dimension Club, Limited in New York only, Prof. U. R. Punkadilawoof presented a paper on the solution of constant K. The following is an abstract of Prof. Punkadilawoof's paper:

"When two or more primordial protoplasms become deoxidized, the escaping hydrogen gas being lighter than air, rises, creating a cyclonic whirl and a vacuous tendency which sucks in other dissociated and positively energized atoms which also being impelled along the line of least resistance determining the direction of the wind, which inpinging upon the face of the aeroplane, as differential from the blast of the propeller, creates a pressure normal to the chord of that surface expressed in kilograms per square meter until the centre of pressure moving ahead 33% with an angle of incidence of 18 degrees, so that the resolution of the corresponding parallelogram of forces might leave the real value somewhat in doubt if this paradox had not been pointed out by Lilienthal and enlarged upon by Eiffel, sufficiently to demonstrate that the correct axis of co-ordination is not postulated at low angles of incidence, whereupon it follows, that the nomenclature usually adopted utterly fails to intimate the true relations between a biplane and a monoplane, although this pressure increasing with the square of velocity must be considered in relation to aspect radio perimeter, and convexity, further, the efficiency increases, nevertheless, this disturbance of the aerodynamic balance reduces the inherent stability to a negligible quantity while the horizontal component of thrust is raised to a maxim as measured along the radius vector of the polar diagram relying solely upon stream line forms and figures of revolution to lower the manometric pressure as indicated by the absorption dynamometer until the augmentation of the total horse power establishes the lateral equilibrium.

Prof. I. M. Pieface, the chairman of the club, in behalf of the club, presented Prof. Punkadilawoof with the club's yearly prize of $50,000.

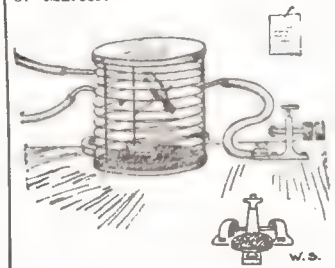
I might mention to all those interested should read this paper, as there is food for thought.

Correspondents

Buzzards Roost, Mass.,
July 9th, 1912.

Dear Mr. Fips:

For some time I have wanted to subscribe to "The Screech," but have been in doubt about the payment. What kind of wave should be used? Tuned, untuned, sad sea, or Marcel?



Please find enclosed, sketch of my combined helix and bird cage. Inside can be seen Little Tom.

When I attach my ½-kw. transformer, and press the key, I get a clear, high-pitched note (out of the bird).

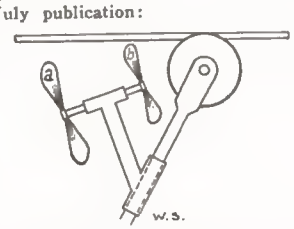
Yours painfully,
IGNATZ EARAKE.

(The Editor has taken liberty to place a rat in the cage, to keep the bird company.)

Santa Ana, Cal.
Aug. 3d, 1912.

Most Unsurpassable Editor:

A commentary on Patent No. 1,027,756, for cooling device for trolley-wheels, granted to an Illinois gentleman, and mentioned in your July publication:



Instead of a funnel a small windmill turning a fan may be used with equally satisfactory results—"a" being windmill, "b" being fan.

Your humble servant,
JOHNNY OWL,
No. 23 Spook Avenue.

FROM ME.

There was a young man from Me,
Who was most dreadfully ve;
Wherever he'd go,
He'd bother girls so
That he would give 'em a pe.

Fips, with apologies to Woman's Home Companion.

The Grattle

All fool questions are answered free of charge in this department. Sane questions will be answered C. O. D., express collect. Inasmuch as we are receiving now upwards of 6,675 letters a day, asking for information, it is self-evident that we can only answer the craziest questions. All other ones are sold as fertilizer, and as such are well worth the money we get for them.

WIRELESS AROUND THE WORLD.

(9656). Ephraim M. A. Gnet, Missou, R. I., yelps:

Q. I believe that wireless will be perfected to such an extent shortly that it will be possible to send a message around the world. What worries me is: How will you know that the message actually gets back to the receiving point?

A. You amaze us, Ephy, dear. We are flabbergusted by your ignorants! Such a simple thing, too! Well, Ephy, it is like this: Suppose you send a message around the world. All right. It leaves of course by the aerial. No sooner has it left than the very same message rushing around the globe in less than a second, enters again via the same aerial. In other words, you understand that long before the entire message has been sent, the first part of it is back again at its destination and gets mixed up with the part of the message still going out. From this you will see that the last part of the message can never be sent out, as the first part which returns will always be in the way.

Thus, as soon as you find that you can't send out the last part of a message, you can safely judge that your message has gone around the world. It's the old story of the snake trying to swallow its own tail. Up to a certain point it works well, but as soon as the snake's mouth reaches the back of its head, the problem becomes so ticklish that even a starved snake refuses to be interested! Next!

DIFFERENTIAL AERIAL.

(19+16) Alva V. Olt, Calamazick, Cal., screeches:

Q 1. I have constructed an aerial as follows: It has four strands. One strand is copper, one strand German silver, one strand iron, and the last strand is aluminum. All strands are connected in series. Will this aerial work?

A 1. Alva, dear, your aerial will work thus: When a wave comes and strikes the copper strand everything is legally correct, but when it strikes the German silver or the iron strand, it finds that it has been tricked into the trap and will hastily beat a retreat. Therefore, we don't think that the aerial is any good.

New Wireless Clubs

FRUITVALE WIRELESS CLUB.

Here is a list of officers of our club: Joseph C. Brewer, president; Alan Downing, vice-president; Abner Scoville, secretary, 2510 Fruitvale avenue, Oakland, Cal.; Chrissie Eiferle, treasurer.

WILDWOOD WIRELESS ASS'N.

There has been recently organized in Wildwood a new wireless association, which, through the progressive spirit which has been exhibited in its foundation and membership, gives promise of becoming an institution of the greaest influence and value among the amateur wireless operators of South Jersey. The discussion of various topics appertaining to the art is to be taken up by members best informed upon each subject, and many points of value should be brought out.

All who are interested in the art of wireless communication, and reside in South Jersey, are urged to lend their support. The organization has its meeting place at the Hotel Beach-Wood for the present. The following officers have been elected for one year: Russell Kurtz, president; Walter Neferdorf, vice-president; Chas. E. Rakestraw, Jr., secretary and chief operator; J. Crozier Todd, treasurer.

Any person wishing further information will please write to the secretary, 110 East Pine avenue, Wildwood, N. J.

Y. M. C. A. WIRELESS CLUB, OF WILLIAMSPORT, PA.

This club was organized here last winter. It has twenty-two members, and is doing good work.

The officers of the club are as follows: Lewis Holtzinger, president; Christian Coup, vice-president; Lester Lighton, secretary, Y. M. C. A. Building, 211 West Fourth street; Robert Templeman, treasurer.

COLORADO WIRELESS ASS'N.

The Colorado Wireless Association was formed July 9, 1912, for the purpose of furthering the development of wireless telegraphy in Denver and the State of Colorado. Officers have been elected as follows: William Cawley, president; Thomas Ekrem, vice-president; W. F. Lapham, secretary and treasurer.

A list of the charter members follows: Edward Stockman, George Barnett, A. O. Jensen, Glen B. Rogers, W. H. Smith, Ruthen H. Lacey, Ruben Sandell, Jas. L. Ware, Carl Stephenson, G. Hines and Merle Davis.

The association will be glad to hear from any person in any way interested in this organization. Address all communications to the secretary and treasurer, 1545 Milwaukee street, Denver, Colo.

WIRELESS ASSOCIATION OF SAVANNAH

On the night of July 19, 1912, the amateur wireless operators of Savannah, Ga., met at one of their stations and organized a club which is to be known as the "Wireless Association of Savannah."

They adopted a set of rules for admission and government, and elected the following officers: Philip C. Bangs, president; Arthur A. Funk, vice-president; Lewis H. Cole, secretary; Hugh Jenkins, treasurer.

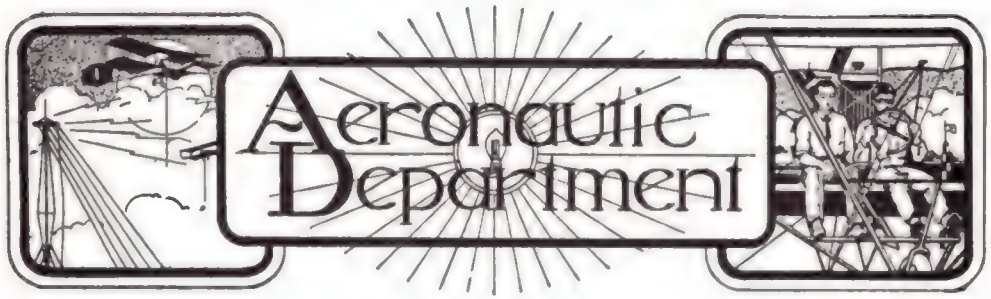
The club meets every Friday night at one of the member's houses to discuss questions arising during the week, pertaining to wireless telegraphy and telephony.

Each member has a station, with both sending and receiving instruments capable of communicating with other members over a radius of 10 miles, while some of the members' stations are capable of copying messages from 800 to 1,000 miles.

The main object of the club is to bring the amateurs of the city in closer touch with each other, and learn to copy so they will know when they are interfering with commercial messages.

The club solicits correspondence with other clubs in the State of Georgia or United States. Address all correspondence to L. H. Cole, 303 Price street, Savannah, Ga.

The club subscribes to a number of electrical magazines, but finds *Modern Electrics* the most helpful.



The Possibilities And Future Of Hydro-Aeroplaning

By Austin C. Lescarboura
Member of the Aeronautical Society.

It is said that the conception of the hydro-aeroplane in America originated in the pontoons which Glenn H. Curtiss employed on his biplane in the flight from Albany to New York City during 1910. These pontoons consisted of air-tight metal cylinders which were placed on the various parts of the aeroplane to enable the machine to float on the water in the advent of a forced descent. With the successful employment of these floats, the aeroplane experimenters conceived the plan of having flying-craft arise from, as well as alight upon the water.

In America, Curtiss produced the first successful hydro-aeroplane in the earlier period of 1911, and since then the development in this direction has been both rapid and promising. At present, every standard type of aeroplane in the biplane class has been successfully employed as a hydro-aeroplane, and even monoplanes are now being used with gratifying results.

The hydro-aeroplane, as it exists today, is an aeroplane which has been fitted with floats in place of the usual wheels and landing chassis. Such a machine can travel on the surface of the water in the same manner as a motor boat, and at the will of the operator can arise into the air to any desired height within the limits of the machine. Some types have been equipped with both wheels and floats, enabling them to alight on either land or water, but in practice the resistance of the wheels against the rush of water while speeding along the surface has caused them to be discarded. As an illustration to prove the impediment of the wheels, the experiments of Renaux, while piloting a Maurice Farman biplane at the hydroplane meet at Monaco, are convincing. With his machine equipped with a set of wheels dipping about eight inches below the surface the biplane could not rise into the air, due to the inability to attain sufficient speed. However, upon the removal of the wheels, the biplane carried six passengers with ease.

There are several types of floats or "hydroplanes" in use on the various aeroplanes. Thus far, no particular advantages seem to have been gained by any of the numerous designs, and all appear to give excellent results on the craft to which they are attached.

A Curtiss Hydro-aeroplane in Full Flight.

The Curtiss hydro-aeroplane is a modified biplane fitted with a single long hydroplane mounted beneath the center of the machine. The aviator is seated above the hydroplane and in front of the planes.

An elevator is placed on the extreme forward end of the hydroplane to control the vertical flight of the machine. On both ends of the lower plane small pontoons are attached to prevent the planes from becoming submerged when alighting on the water. This machine has been

HYDROPLANES OF THE BURGESS-WRIGHT.

one of the most successful hydro-aeroplanes and has won recognition both in the United States and in Europe. It is capable of attaining high speeds and can carry one or two passengers including the pilot.

Another American type which has sprung into prominence since its introduction is the Wright hydro-aeroplane. The biplane is fitted with a pair of metal hydroplanes which are mounted in the same manner as the usual skids and wheels. A machine of this type made numerous daring flights in the vicinity of New York City during the first months of 1912, piloted by Aviator Coffin. The Burgess-Wright hydro-aeroplane is similar to the foregoing type, but employs a different design of floats. These are also boat-shaped and made of metal. Owing to the efficient rib construction of these pontoons, they are both light and strong. A biplane fitted with them weighs but fifty pounds more than if it were equipped with the skids and wheels for land flights. The hydroplanes are designed with underwater steps in order that greater speed may be obtained while traveling on the surface of the water.

Of the many French crafts, the Voisin Canard was among the first to attain success, and to-day it is one of the most efficient. It consists of the standard Voisin Canard biplane with its two main planes in the rear and the long fuselage terminating in the elevator and rudder at the extreme front, with the three short pontoons mounted under the main planes and a small float placed under the forward end of the fuselage.

The Farman brothers have turned their attention to the fitting of hydroplane parts to their respective biplanes since the beginning of the present year, and the results have been little less than astonishing. Both the Henri and Maurice Farman biplanes utilize a pair of long floats under the main wings, and a small single float under the rear tail. At the Monaco meet these biplanes carried off the highest awards due to their unexcelled flights with many passengers.

The Caudron biplane is another French machine which has given satisfaction as a hydro-aeroplane. It is equipped with two pontoons mounted a trifle forward of the two main planes, and also a small float under the rear tail. It was piloted by its designer at the Monaco meet, and won distinction for its excellent flights in spite of its moderate dimensions.

Several monoplanes, prominent among which are the Nieuport and the Deperdussin types, are at the present time being fitted with hydroplanes and experimented with in both England and France Several constructors in the former country have not failed to turn their attention to the possibilities offered by the hydro-

POWER PLANT AND CONTROLS OF THE BURGESS-WRIGHT.

aeroplane and many revelations are looked forward to in the immediate future.

While the hydro-aeroplane as it exists to-day is quite practical for exhibition or sporting purposes, it leaves a great many features to be desired before it can be employed to advantage in warfare. It has appealed to motor-boat enthusiasts since it is but an evolution of the high speed water-crafts, and the present year has witnessed the purchasing of these

machines by the most prominent sportsmen. At the more important watering places hydro-aeroplanes are frequently seen, and passenger flights are undertaken by enterprising aviators at reasonable rates. It is claimed that hydro-aeroplaning is one of the most fascinating forms of sport—much more so than aeroplaning—and still the danger is not greater than that involved in regular motor-boating at high speeds. Several aviation schools in America and abroad have adapted these machines for the teaching of pupils, realizing the comparative safety of such flying, and also eliminating the costly breakage of the crafts which forms such an important item in the tuition of aviators. The avoidance of breakage has enabled the schools to reduce the cost of their courses to an appreciable degree. Another interesting employment of the hydro-aeroplane has been lately adapted, and that is the testing of new aviation engines under actual flying conditions. Formerly motors were tested on stands at the factories, and afterwards shipped to the user. At present the hydro-aeroplane may be equipped with the engine and actual flying at either low or high altitudes attempted with little danger to the aviator if the engine fails to operate satisfactorily. If a regular aeroplane were employed, the failure of the engine at low altitudes would probably result in a crash to earth and injuries, if not death, to the pilot.

The present types are barely developed to a point where they could be dependable in actual warfare. It often happens that during flights the engine becomes inoperative and the hydro-aeroplane alights upon the water. After several unsuccessful attempts to start the engine, the aviator is compelled to await the appearance of a boat to tow the machine to the land or moorings. In actual warfare such a predicament would be a very serious incident, not alone resulting in the capture of the machine and its occupants, but also of dispatches or special papers which might be carried. It has been recently suggested by an eminent authority that hydro-aeroplanes should be fitted with a small auxiliary motor connected to a shaft and submerged propeller, which would enable the disabled machine to travel on the water despite the failure of the main engine. This additional power plant would instead of becoming a helpless craft provide a means of escape from capture, upon the failure of the engine. Not only would this feature be of unquestionable value in military machines in the absence of reliable aviation motors, but also for the hydro-aeroplanes used for sporting and exhibition work. Another overlooked point of importance which applies to both the hydro-aeroplane and the aeroplane, is the equipping of flying craft with tool kits and spare parts. Time and again, an aviator experiences engine trouble and upon alighting discovers that the trouble may be easily remedied with the use of suitable tools. However, since these are not at hand, he is helpless to proceed with the repairs, but must await the arrival of help. Inasmuch as automobiles carry complete tool equipments though they are far more reliable than the average flying machine, it is logical to assume that the future flying-craft will carry tools and such spare parts as propellers, struts, skids, and other breakable parts which correspond to the tires of the automobile.

Though aeroplane construction has made important advances, the machines are not sufficiently sturdy to withstand heavy seas or the impact of poor landings. Instead of equipping aeroplanes with "boats," the future development will follow along the lines of placing planes on a boat in order to obtain the ultimate hydro-aeroplane, since the machine should primarily be considered as an aquatic craft. The "flying-boat" of Glenn H. Curtiss which has recently been tried is an excellent example of the probable future machines.

As to the future of the hydro-aeroplane, it is beyond a doubt a most promising one. Offering practical safety, as it does, it will be patronized by many who would never trust themselves to the aeroplane. For naval warfare it will play a most important rôle, not alone for bomb-dropping which at its best will apparently have but little effect on the especially protected dreadnoughts, but for the locating and studying of the enemy's position and carrying papers and passengers from ship to ship. It will prove of even greater value in flying over fortresses and reporting to the attackers the conditions behind the walls and also the results of the bombardment.

As a commercial enterprise, there appears to be no reason why several passengers should not be carried between cities or points which are connected by waterways, and at a much greater speed than is possible by railway. Naturally, such transportation will be costly, and favored by wealthy travelers. At the present time, arrangements are being made to inaugurate such service between several points on the Atlantic Coast, and with the steadily improving machines, a time will undoubtedly arrive when a large number of passengers will be carried at a moderate fare.

PORTABLE HANGARS FOR DIRIGIBLES.

The accompanying illustration shows one of the latest hangars which have been designed by two Italian engineers, Messrs. F. Bosco and L. Donatelli, and have been adopted by the army.

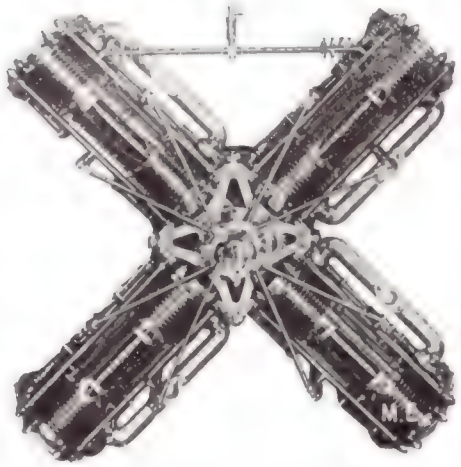
The balloon shed is made up of a number of arched sections, varying in number according to the length of the structure. All the skeleton work is of steel and iron, with a fabric covering

to keep out rain and wind. The various portions of the framework are fastened together by interfitting joints, which are then rigidly held together by pins. The structure being assembled on the ground, is then raised. By using a hinge principle of joining the parts together, as well as for the bases of the arch, the entire structure can be rapidly assembled or demounted, and when completed forms a strong wind-resisting hangar.

The lack of proper hangar facilities has been one of the greatest drawbacks against the more extensive use of the dirigibles, and with this disadvantage removed, it is quite probable that they will figure more prominently in the military aeronautics of Italy and other nations.

A NEW TYPE OF AEROPLANE MOTOR.

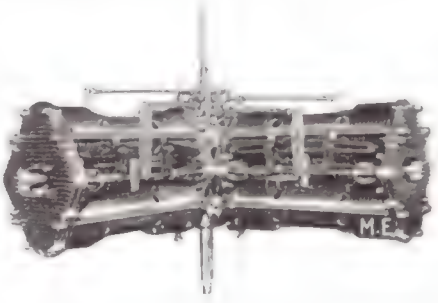
The motor is conceded to be the weakest point in the present day heavier-than-air flying machine, and the constructors await with no little in-



terest the production of a reliable engine.

An important advancement toward this end has been made in the new Italian military Favata engine, which is illustrated in the accompanying engravings. Not only does this engine solve an important and much-sought advantage of avoiding an accidental stopping while in flight, but it also possesses a remarkable amount of power for its weight.

The Favata engine actually consists of four separate motors, which are assembled around a common center and



drive one shaft. It is claimed that with three units disabled, the remaining motor unit can exert sufficient

(*Continued on page* 666.)

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three (3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

PLEASE NOTE THAT THE DESCRIPTION OF THE STATION MUST NOT BE LONGER THAN 250 WORDS, AND THAT IT IS ESSENTIAL THAT ONLY ONE SIDE OF THE SHEET IS WRITTEN UPON. SHEET MUST BE TYPEWRITTEN OR WRITTEN BY PEN. DO NOT USE PENCIL. NO DESCRIPTION WILL BE ENTERED IN THE CONTEST UNLESS THESE RULES ARE CLOSELY ADHERED TO.

It is also advisable to send two prints of the photograph (one toned dark and one light) so we can have the choice of the one best suited for reproduction.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE THREE DOLLARS.

Herewith enclosed find flashlight of wireless set I have just completed.

Sending set consists of two kw. closed core transformer operated on 220

KILLIAN STATION.

volts; helix, twelve turns No. 2 copper wire spaced 1½ inches apart, wound on strips of hard rubber set in oak uprights; condenser, fifteen sheets of plate glass 20 x 30 inches, using 40 gauge sheet brass for electrodes instead of tinfoil. I find that brass does away with blistering, to a large extent, and makes a more substantial job. The spark gap is a rotary, using nine-inch wheel with sixteen points, on shaft of 1/30 h.p. motor, running 1,800 r.p.m. Balance of set consists of hot wire ammeter, a reconstructed key capable of carrying 30 amperes, and an aerial switch of my own design.

Receiving set comprises a loose coupler, primary wound with spaced bare wire, secondary variable by eleven point switch; two rotary variable condensers, fixed condenser and potentiometer, four detectors, silicon, electrolytic, perikon and universal. Set mounted on cabinet. I use Navy Standard 3,200 ohm receivers.

My aerial is composed of six wires three feet apart, 70 feet high at one end and 50 feet at the other.

G. L. KILLIAN, Colorado.

HONORABLE MENTION.

Enclosed please find photograph of my wireless equipment. It consists of the following apparatus: Perikon, ferron, carborundum, silicon, pyron, and audion detectors; Mesco telephone condenser, Murdock variable receiving condenser, Brandes' 1,000-ohm 'phone, loose coupler, loading coil. These, with necessary switches, are the extent of my receiving side, which, as you will note, are mounted on a separate table, which is portable, connection being made by means of a plug which can plainly be seen on the sending table. The sending set consists of a home made helix, aerial switch, home made key with extra heavy silver contacts, condenser for vibrator, sending condenser made of six photo plates, four by five inches, and a one-half kw. open core transformer. This piece of apparatus I am really proud of, owing to the fact that I have successfully transmitted 35 miles, using 6 volts storage

battery; and, furthermore, the receiver stated that "NY" who is located midway between us, was working at the

KELLER STATION.

time, and that he could hear me as clear as "NY."

C. C. KELLER, New York.

HONORABLE MENTION.

Herewith is a photo of my wireless station.

My sending set consists of ¼-kw. transformer, two condensers, one variable zinc spark gap, helix, key, double throw switch; also other switches for different purposes.

My receiving set consists of a loose coupled transformer, silicon and galena detectors, 2,000 ohm receiver set, fixed

MOSES STATION.

and variable condensers and buzzer test. Just to the left of the helix is seen an automatic cut-out used in connection with the sending set. I constructed all my instruments except the switches; and I have obtained excellent results. My aerial is about 54 feet long and consists of 6 wires (4 copper and 2 aluminum on 8 foot spreaders). At one end my aerial is about 100 feet high and at the other about 60 feet. I have taken *Modern Electrics* for two years and have found it a great help in constructing my instruments.

MONTAGUE MOSES, California.

HONORABLE MENTION.

I beg to herewith enclose you a photograph of my wireless station.

For receiving I have a 12-inch tuner of my own construction, 4 slides; fixed condenser; silicon detector; and a 3-point Keystone switch, all mounted on a large board. I use a 2000 ohm. receiver, the transmitting set consists of a 1-inch "Electro" bulldog spark coil, an "Electro" zinc spark gap, the "Electro" sending helix, the "Electro" adjustable condenser, and a Morse key with heavy German silver contacts, a double D. P. D. T.

TAISHNER STATION.

porcelain switch. My aerial is made of four aluminum wires, 6 inches apart, 100 feet long, 35 feet high. I use the "Electro" storage battery, 6 volt, 60 A. H. With this station I am getting along finely. I am finding *Modern Electrics* a good help to me in the work, and am recommending it whenever possible.

ANTHONY TAISHNER,
New York.

HONORABLE MENTION.

The following is a description of my ½-kw. wireless set:

The aerial consists of 4 wires, No. 12 aluminum, 250 feet long, 100 feet high and spaced 4 feet apart.

For convenience in receiving a break-in key system is used. It consists of an anchor gap in the ground circuit with the receiving set connected across it. Two relays automatically disconnect the receiving set from the anchor gap when sending. These relays, together with a magnetic key are operated on a 6-volt storage battery.

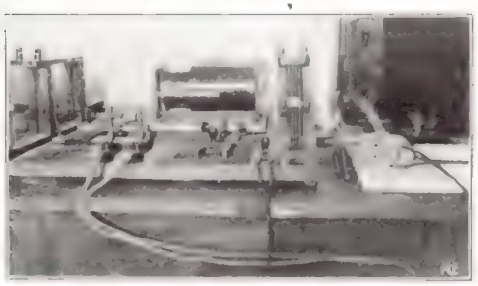
The transmitting set is enclosed in a large box to reduce the sound produced by the rotary gap.

It consists of:

A ½-kw. closed core transformer con-

SEARING STATION—SENDING APPARATUS.

structed of a soft iron wire core and 6 "Electro" ½ inch spark coil secondaries, the primary being wound for 60 cycles, 110 volts; a rotary spark gap, glass plate condenser, oscillation transformer, protective condensers and an electrically operated key. The rotary spark gap is run on a low-voltage transformer.



SEARING STATION—RECEIVING APPARATUS.

The receiving set consists of a loose coupler, 2 "Electro" variable condensers, fixed condensers, 2 galena detectors and a pair of Brandes' "Trans-Atlantic" type receivers.

The mean working range of the transmitting set is about 50 miles, but at times greater distances have been covered.

The receiving range is about 1,000 miles.

Call letters are H. R.

H. R. SEARING, New York.

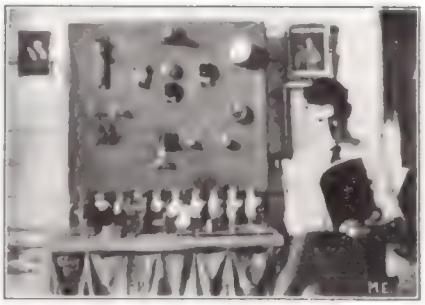
HONORABLE MENTION.

Enclosed please find photograph of my experimental apparatus, the greater part of which I have made myself.

On the board there are: Arc-light, Geissler tube, bracket lamp with shade, door-bell, buzzer, ammeter and voltmeter, wall base socket and lamp, and the necessary switches.

On the table are: ½-inch "Bulldog" coil, spark gap, key, small Tesla coil, medical coil, 5-inch fan, learners' telegraph outfit, relay and switches.

Since this picture was taken, I have added another ½-inch coil, large Tesla coil, and helix.



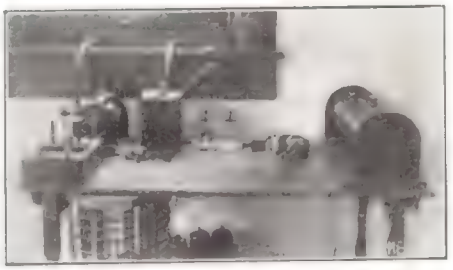
MOTTASHED EXPERIMENTAL APPARATUS.

I have no wireless station yet, but I have experimented with the coil for short distances.

MARVIN MOTTASHED,
Louisiana.

HONORABLE MENTION

Find enclosed a photo of my station. My receiver set consists of: tuning coil, variable and fixed condensers, E. I. Co.'s 'phones, and universal detector with silicon. The coil is made of enameled wire,



JENKINS STATION.

which is wound upon a solid wood core which had first been covered with glue. I like this method. I use a sounder to

test my detector. The sending set consists of E. I. Co.'s coil and gap, with home-made interrupter, condenser and helix. The second D. P. D. T. switch makes it a simple matter to change the coil from A. C. to battery current.

RUSSELL JENKINS. Michigan.

HONORABLE MENTION.

Here is a photograph of my wireless station.

My sending outfit consists of a 2-inch wireless coil, run by a Thordarson transformer, a Murdock key and gap, four jar condensers, and a helix. All of these may be seen on the table except the helix which is underneath.

My receiving outfit consists of two tuners, a double slide Murdock and a loose coupler, a detector, two condensers, and a pair of 1,000 ohm 'phones. A buzzer and several switches are used with these instruments.

BEAN STATION.

My aerial is 42 feet high and 60 feet long, with 6 wires (loop system). I get very good results with these instruments.

JAMES BEAN, California.

WHAT HORSEPOWER REALLY MEASURES IN WATTS.

By Dr. Leonard Keene Hirshberg.

The Bureau of Standards has just issued a bulletin on the kilowatt equivalent of horsepower. The most frequently quoted equivalent in watts until now has been seven hundred and forty-six. Since, however, the pound weight as a unit of force, varies in value as the acceleration of gravity varies, the number of foot-pounds per second in a horsepower accordingly varies with the lititude and altitudes. It is equal to 550 foot-pounds per second at 50 degrees latitude and sea level, approximately the location of London, where the original experiments were made by James Watt to determine the magniture of the horsepower.

The continental horsepower which is used on the continent of Europe, differs from the English and American horsepower by more than one per cent. Its usual equivalent in watts is 736. This difference is due to the confusion which exists in the weights and measures of 100 years ago. The metric system soon placed the various values of the horsepower in terms of seventy-five kilogram-meters per second, although the original English equivalent would be 76.041 kilogram meters per second.

Since a unit of power should represent the same rate of watts at all places the continental horsepower is best defined as 736 watts, which is equivalent to 75 kilogram meters per second at latitude 52 degrees, 31 seconds. In the future 0.746 kilowatts will be used as an exact equivalent of English and American horsepower.

ITALIAN AMERICAN WIRELESS EXPERIMENTAL CLUB

Our officers are as follows: President, Michael Comforte; Vice-President, James De Milte; Secretary, James Locont, 146 Bleecker street, New York City; Treasurer and Director, Albert Scelzi.

Our laboratory is fully equipped with every kind of material used both in wireless telegraphy and telephony.

Any person who is interested in this art is requested to correspond with the Secretary.

We are doing good work and we wish to continue doing it as much as we can.

We hope to interest a good many, as it is certainly worth while.

Our aim is to help amateurs in their experiments and research work.

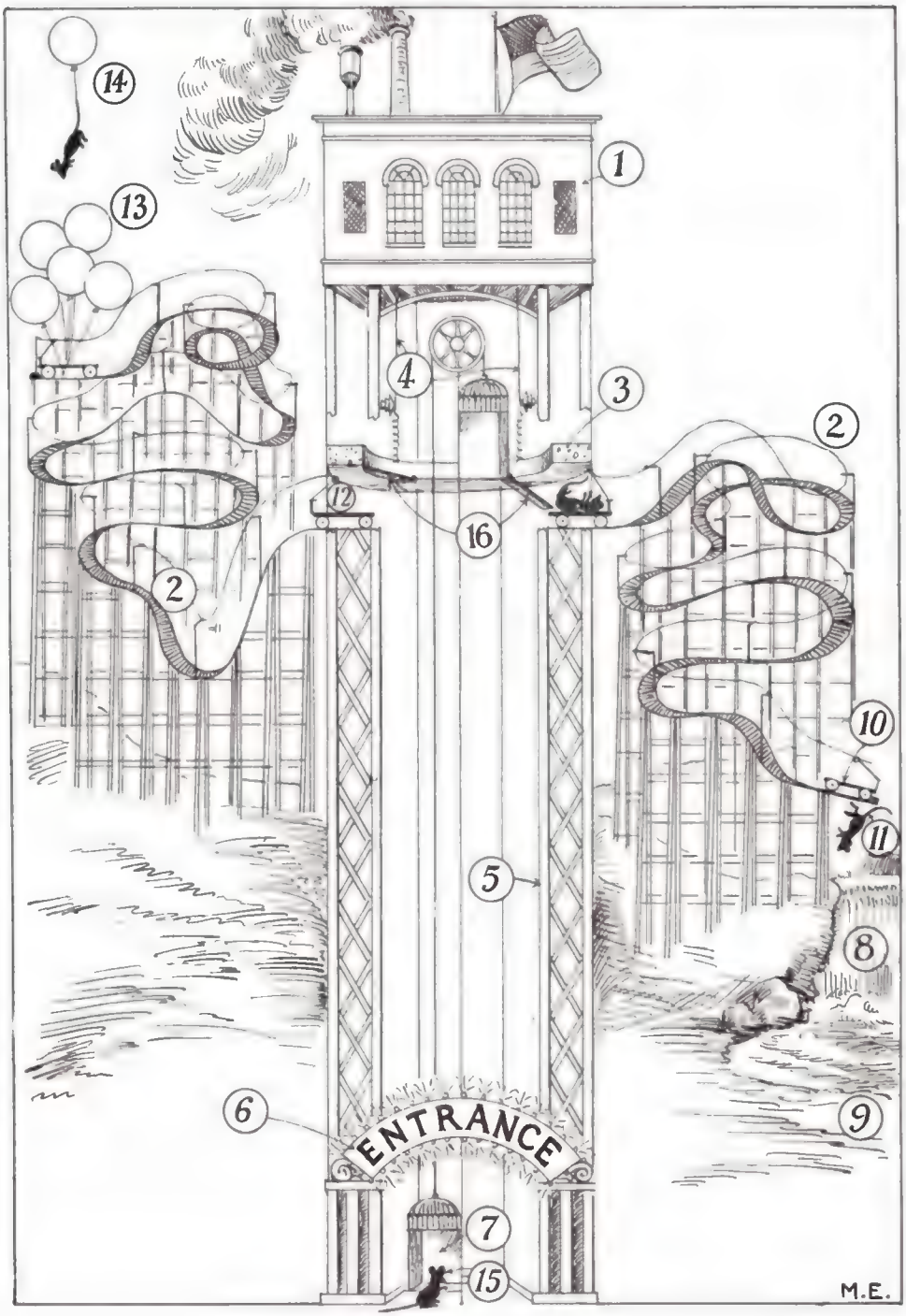
JAMES LOCONT, Secretary.

NORTHWESTERN WIRELESS ASS'N OF CHICAGO.

At the election of officers of the Northwestern Wireless Association of Chicago, July 10th, 1912, the following were appointed: President, R. Strom; vice-president, R. Rolfson; treasurer, Ed. Egloff; corresponding secretary, L. J. Healy, 3349 Lincoln avenue, Chicago, Ill.

The Right Rat Trap

(Pat. app'd for)

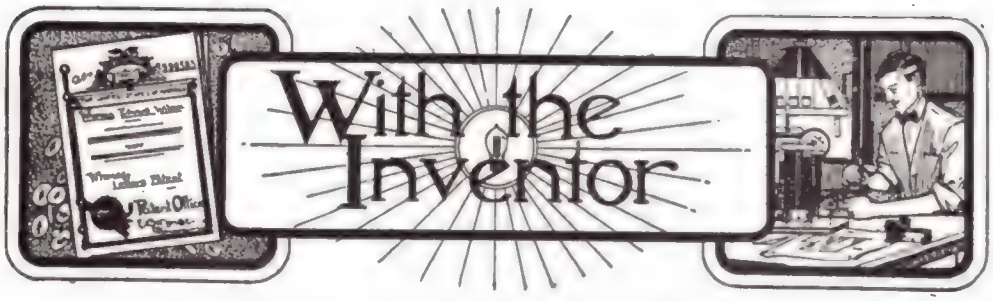


We are happy to present herewith the latest invention in rat traps, doing away with any chance of not killing the rat.

The rat, 15, enters into the luxuriously appointed elevator, 7, and is hoisted up rapidly. Upon disembarking from the elevator it is presented with the cheese, 8, but, at the same time, the rat steps on the trap door, 16, charged with 1,000,000 volts, whereupon the rat is killed immediately, and falls upon the trolley car, 12, and after an enjoyable ride over the electric roller coaster, 2, the electric trolley car comes to an abrupt stop, at 10, whereupon the rat, 11, falls into tne cataract, 8, and is finally drowned, at 9.

If the rat does not prefer this mode, it may go up on the left side of the elevator, and instead of falling into the water and thereby getting wet its body is automatically fastened to one of the balloons, 13, after the trolley car on the left has come to a stop, and is hoisted up into the air, 14, a distance of several miles, thereby freezing it, and after the balloon has exploded and the rat has returned to the earth it will be quite refrigerated, also busticated.

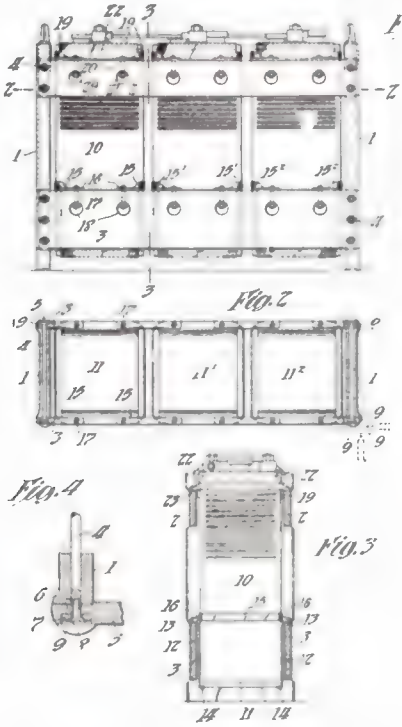
The power house is shown at 1, while 4 represents the high tension current.



PATENT NO. 1,034,003 HAS BEEN GRANTED TO THOMAS A. EDISON, OF ORANGE, N. J., FOR A BATTERY-CELL CONTAINER.

The present invention is the latest issued to the well-known inventor, and we quote from the patent specification, as follows:

The object of my invention is to produce such a structure in which a plurality of cells may be firmly held out of contact with each other and in such a manner that the danger



of short circuiting between the cells will be obviated, and also to hold the cells so firmly as to prevent independent movements of the same when the structure is shaken or vibrated, as it needs must be when contained in an automobile or other vehicle. Heretofore, the cells of the battery have been so mounted that they are likely to become loose in the tray, and the electrolyte is apt to be shaken out of the gassing openings in the cells when the same are carried by an automobile. By my invention I provide an efficient, simple structure of the type indicated, in which the parts may easily be mounted and adjusted or removed when desired.

My invention also consists in the construction of parts and combinations of elements hereinafter more particularly described and set forth in the appended claims.

In order that my invention may be more clearly understood, attention is hereby directed to the accompanying drawings, forming part of this specification, and illustrating a preferred form of my invention.

In the drawings—Figure 1 represents a side view of a container embodying my invention, with three storage battery cans or cells carried thereby; Fig. 2 represents a cross section on line 2—2 of Fig. 1, the cells not being shown; Fig. 3 represents a section taken upon line 3—3 of Fig. 1; and Fig. 4 represents in section an enlarged detail of a fastening means shown in Fig. 2.

Referring to the drawings, the container comprises a frame formed of the upright end members 1, 1 and the upper and lower side strips 2, 2 and 3, 3. These members are preferably of wood. The side strips 2 and 3 may be secured to the end members in any desired manner, as by means of the bolts 4. I prefer to form the joint in the manner illustrated in Figs. 2 and 4, in which one end of the bolt or member 4 is provided with a head 5 and the other end with a drilled hole 6 axially of the member. The bolt 4 is passed through the members to be secured together with the head 5 positioned within a suitable recess in one side member 3, and a punch or similar instrument is forced into the opening 6 in the other end of the bolt and manipulated to force the metal surrounding the end of the opening 6 outwardly into contact with the face of the other member 3, or preferably into contact with the washer 7 positioned within a suitable countersunk recess in the member 3, as shown in Fig. 4. An efficient holding means 8 is thus provided upon the end of bolt 4.

Preferably the corners of the frame are rounded, as shown at 9, the rounded corners projecting beyond the planes in which are located the outer faces of the end and side members, so that when a plurality of trays containing cells are placed side by side or end to end, the rounded corners of the same will abut against each other, as shown in dotted lines in Fig. 2. By this means an air space is provided between adjacent trays or containers.

Thirteen claims have been allowed on this invention which is quite ingeniously con-

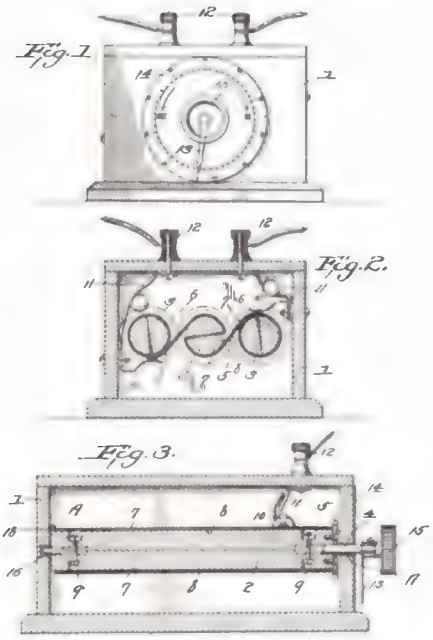
trived, and will probably be used shortly in Mr. Edison's new battery.

PATENT NO. 1,033,095 FOR A ROTARY VARIABLE CONDENSER HAS BEEN GRANTED TO HUGO GERNSBACK, OF NEW YORK, N. Y.

The present invention has already been described in *Modern Electrics* and shows a new patent of Mr. Gernsback's. We quote herewith a few paragraphs of the patent specification:

The present invention relates to a variable condenser which is more especially designed for use in connection with wireless telegraphy and telephony, and which is also adapted for use in the other electrical arts in which such condensers are used.

The object of the invention is to provide a variable condenser which has a rotary adjusting movement, which is very compact in its construction, which can be easily and quickly manipulated, and which is peculiarly designed so as to render short circuiting practically impossible.



The present variable condensers which use intermeshing plates with air dielectric are very bulky owing to the fact that the plates can never approach each other very closely, and are also unsatisfactory owing to the fact that they are liable to get out of repair and much leakage is caused. With the present construction these objections are avoided, since no plates with sharp edges are used, and the parts are simple and work with little friction or wear, thereby rendering the device very durable and long lived.

With these and other objects in view, the invention consists in certain novel combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

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It has been found that unless there is the very closest contact between the slider and slider rod on all tuning coils and loose couplers, perfect tuning and receiving is impossible.

And brass slider rods are not the best conductors because brass tarnishes and corrodes and becomes non-conductive on the surface from finger marks. This makes the contact between slider and rod very poor and unsatisfactory.

The only remedy is to use VOLTITE ELECTRO-PLATING POWDERS and with only a rag and water, nickel-plate your slider rods in half a minute to wear for many months.

Nickel plated parts are all the rage now on professional instruments, and they always remain bright and clean and have a beautiful appearance.

Send 25c. for a trial package of VOLTITE NICKEL which is sufficient to NICKEL-PLATE all your rods.

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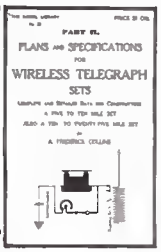
GOOD NEWS FOR WIRELESS AMATEURS



Part II of A. F. Collins' book *"Plans and Specifications for Wireless Telegraph Sets,"* giving data for 5 to 10 mile sets, is

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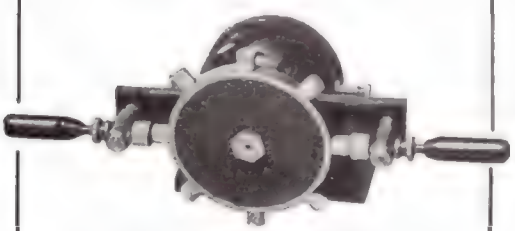
Since the wireless amateur is limited in power, it is essential that he use those devices that give the maximum distance.

Therefore we have designed the

ROTARY SPARK GAP

for, with one Kilowatt limit, the amateur must improve his transmitting device in order to be heard at all.



Disc, 4 inches in diameter. Renewable Zinc Gaps. Mounted on fibre base, so as to be screwed directly to table.

This Rotary Spark Gap has been constructed to give a spark frequency of 500 a second, but by the use of a small rheostat the frequency may be varied at will.

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1st. To operate with perfect satisfaction up to one Kilowatt.
2d. To give a high musical note.
3d. To be free from heating or arcing when used at its rated capacity.
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With motor to operate on 110 volts A. C. or D. C. $12.00
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A drum 2 and pair of rollers 3 which have a parallel and spaced relation to each other are suitably journaled within the casing, one of the trunnions 4 of the drum 2 projecting through one end of the casing and being provided with a suitable knob or handle 15. This handle would preferably be formed of some insulating material such as hard rubber, and constitutes a means for turning the drum 2. One end of the drum 2 is provided with a gear wheel 5 which meshes with corresponding gear wheels 6 upon the rollers 3. These gear wheels may be formed of fiber or other suitable material and serve to simultaneously turn the rollers 3 when the drum 2 is rotated in either direction. A sheet 7 of conducting material, and also a sheet 8 of dielectric material is provided for each of the rollers 3. These sheets of dielectric and conducting material are fitted against each other so as to have a superposed relation, one end of each of the sheets being secured to the drum 2 in some suitable manner, while the opposite end of each of the sheets is secured to the corresponding roller 3. These sheets may be secured to the rollers and drum in any suitable or approved manner, although in the present instance both the drum and the rollers are shown as formed in longitudinal sections which are held together by means of the fastening members or bolts 9, the ends of the sheets 7 and 8 being inserted between the longitudinal sections of the drum and rollers and clamped securely in position by means of the bolts 9. The sheets 7 and 8 extend from the bottom of the drum 2 to the top of one of the rollers 3 and from the top of the drum 2 to the bottom of the opposite roller 3, and these sheets are so arranged as to be wound upon the drum 2 and unwound from the rollers 3 when the drum is turned in one direction and unwound from the drum 2 and wound upon the respective rollers 3 when the said drum is turned in the opposite direction. It will further be observed that the sheets of conducting and dielectric material 7 and 8 are so arranged upon the drum and rollers that a layer of dielectric material is always interposed between successive layers of conducting material upon both the drum and the rollers, thereby preventing the sheets of conducting material from being brought into contact with each other or with successive turns of the same sheet as they are wound upon the drum 2. Any suitable means may be provided for making contact with the sheets 7 of conducting material, and in the present instance a pair of spring brushes or contact members 10 are provided. These spring brushes 10 are secured to opposite sides of the casing 1 and have a yielding engagement with the respective sheets 7 of conducting material upon the rollers 3.

These brushes, 10, are connected by suitable conductors, 11, to binding posts, 12, at the top of the casing, 1.

From the foregoing it will be understood that in this condenser, on account of the metal sheets coming together within less than 0.001", the capacity is necessarily very high with respect to the small size of such an instrument.

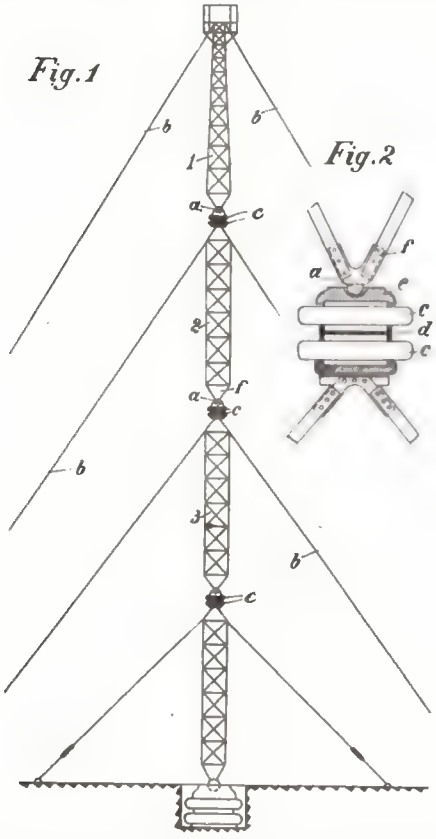
The important part about this invention,

however, is that a very accurate adjustment is had with but little trouble, and that the condenser can be used in any position without losing its adjustment, as for instance, on shipboard. The inventor also suggests that the condenser might be used for high tension purposes by using suitable dielectric sheets and sinking the entire condenser into oil or other high grade insulating fluid. Ten claims have been allowed on this patent.

FRIEDRICH GEORG FRANZ BRACKERBOHN, OF WILHELMSRUH, GERMANY, HAS BEEN GRANTED PATENT NO. 1,034,760, FOR A MAST FOR RADIOTELEGRAPHY.

This invention relates to a new mast for wireless telegraphy and the inventor gives the following explanation of his rather startling invention:

It has been found that the girder masts erected at large central stations for radiotelegraphy for suspending the transmitting



and receiving aerials exercise a certain prejudicial influence on the telegraphic process in spite of their being insulated from the ground, and that this injurious action has increasingly increased with the constant increase in height of such masts.

A primary object of my invention is to provide means which not only obviate this defect, but enable iron masts of any desired height to be used. It is to be understood that in making such masts an iron lattice-girder

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in your station will insure perfect service. You require 'phones which are sensitive to the feeblest impulses: which will talk up in clear, distinct and readable tones; which will be on the job at all times.

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We make them to give a certain clear note which is readable under all circumstances.

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construction will be employed both on the ground of strength and also for economic reasons.

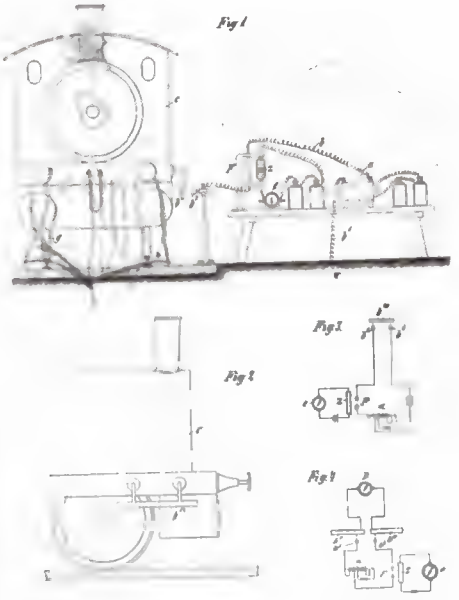
The girder mast forming the subject-matter of my invention is characterized by its being not only subdivided in a manner well-known in itself and by its part being electrically insulated from one another likewise in a manner well-known in itself, but by these individual parts being placed one above another and connected by an articular connection, *e. g.* a ball-bearing, a tangential tilting bearing, swing support, or the like, resting on the insulation of the joint, and each part being held independently by means of stay wires insulated in well-known manner from the ground.

This mast appears to be particularly difficult of erection, and it should have more than four guys attached to each section, as otherwise, if a single guy wire breaks, the mast having no rigidity as a whole, the section to which the broken guy was attached, as well as all those above it, would come down, and this would probably wreck the remainder of the mast.

EDWARD HERMSDORF, OF BRUNSWICK, GERMANY, HAS BEEN GRANTED PATENT NO. 1,035,009, FOR A SYSTEM FOR ELECTRICALLY TRANSMITTING SIGNALS.

We quote part of patent specification of this invention:

My invention relates to improvements in systems for electrically transmitting signals from or to movable bodies, and more par-



ticularly to signaling apparatus for trains, elevators, hoisting machines such as overhead traveling cars, trolley cars, etc. Apparatus of this class such as are now in use are unsatisfactory in operation, because the contact between the movable and stationary parts can not be made in a simple and reliable way.

The object of my improvements is to provide a system in which the difficulty of providing a reliable contact is avoided.

With this object in view my invention consists in providing the connection between the relatively movable parts over a spark gap which is adapted to be traversed by currents of high voltage.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawings, in which the same letters of reference have been used in all the views to indicate corresponding parts.

In said drawings—Figure 1, is a front view of a locomotive and a diagrammatical view of apparatus for providing high voltage currents, a spark gap over which the locomotive and the said apparatus are connected, and a signaling device. Fig. 2 is a partial side view of a locomotive showing a modified form of the pole carried by the locomotive for the spark gap to increase the duration of the signal and Figs. 3 and 4, are diagrammatical views of further modifications of the signaling system.

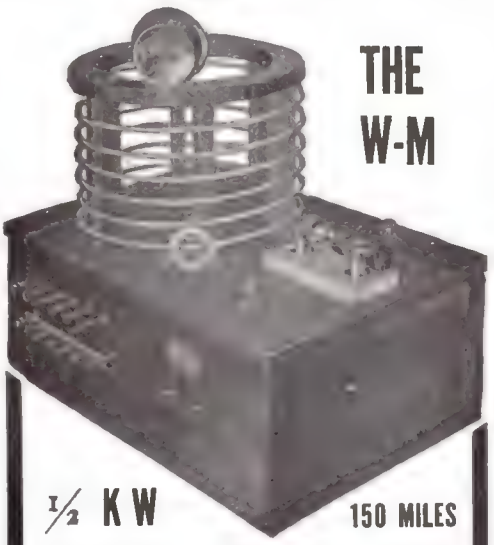
Referring more particularly to the drawings the signaling system consists of an electric circuit which includes an apparatus a for producing an electric current of high voltage, such for example as an induction coil, a condenser, Leyden jars, or the like, an indicating apparatus F, and one or more spark gaps consisting of a pole or poles carried by each of the relatively movable parts, and electric conductors b and b^1.

In the example shown in Fig. 1 the apparatus a for producing current of high voltage, the indicating apparatus F, and the pole b^3 are mounted on the stationary part, that is on or adjacent to the track, while the pole b^4 is provided on the movable part, that is on the locomotive c, and in such a position as to pass along and in close proximity to but out of contact with the pole b^3. Over the conductor b^1 and the metallic parts of the locomotive c, and the wheels g, the circuit is connected to ground at the point x and at the rails respectively. Therefore, when the locomotive passes with its pole b^4 along the pole b^3 the circuit is closed over the ground at x, the conductor b, the signaling apparatus F, the spark gap b^3, b^4, the locomotive c, the wheels g, and the rails h, so that an electric discharge takes place between the poles b^3, b^4.

The signaling apparatus F is constructed in such a way as to be operated by electric discharges of the character referred to. In the example shown it consists of a spark gap arranged to act on a coherer z which energizes a galvanometer e or relays. The coherer energizes the relays or galvanometer e whenever the pole b^4 is brought in position to permit an electric discharge between the poles b^3 and b^4.

If it is desired to increase the duration of the electric discharge over the poles b^3 and b^4, and thereby the duration of the signal, either both of the poles or one of them may be elongated in the direction of the travel of the vehicle.

In the modification shown in Fig. 2 the pole b^{14} which is mounted on the locomotive is constructed in the form of a rail.



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½ KW 150 MILES

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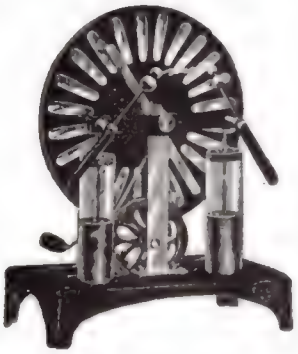

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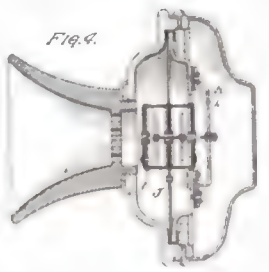
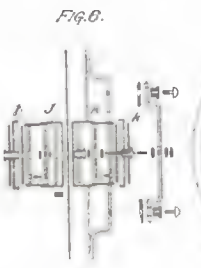
In Fig. 3 I have shown an example in which the circuit provided on the stationary part is provided with two poles b^5 and b^6, while the movable part carries a bridge piece b^{24} which is adapted to form two spark gaps with the poles b^5 and b^6. The said bridge piece may also be divided into two sections b^7 and b^8, as is shown in Fig. 4. Between the sections b^7 and b^8 a second signaling apparatus D may be interposed. Thereby a signal may also be produced on the movable part or locomotive c. Instead of the galvanometer e an acoustic or optical signaling apparatus may be provided.

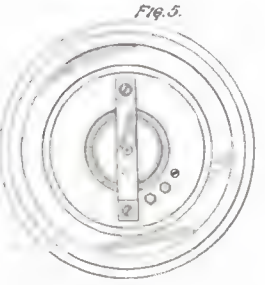
While the foregoing invention is quite a cleverly conceived arrangement we do not see that it will be of any practical use to anyone.

JOHN J. COMER, OF CHICAGO, ILL., HAS BEEN GRANTED PATENT NO. 1,033,087, FOR A DIFFERENTIAL MICROPHONE TRANSMITTER.

The present invention relates to a differential microphone transmitter and should be of particular interest to our wireless telephone







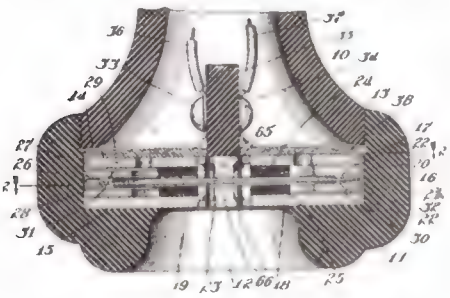
enthusiasts who are always looking for a good transmitter that can carry a high current without overheating.

As will be seen by perusing Mr. Comer's patent, the inventor uses two microphones, J K, attached to each side of the central diaphragm. From this it will be seen that when speaking into the transmitter the vibration is distributed over two microphones, and, at the same time the electric current is distributed over two microphones, and for this reason a higher amount of current can be used than any other similar existing transmitter.

The idea is carried through quite ingeniously and inventors working along these lines will do well to procure a copy of this interesting patent.

LOUIS W. CARROLL, OF RIVERSIDE, ILL., HAS BEEN GRANTED PATENT NO. 1,034,200, FOR A TELEPHONE RECEIVER.

This shows a new construction of telephone receivers and will undoubtedly interest our wireless readers, as this telephone receiver,



were it constructed for wireless purposes, would undoubtedly increase the intensity of the signals a good deal.

It will be seen from Fig. 1 that the inventor uses two sets of energizing spools which act upon both sides of the diaphragm, therefore increasing the vibration of same and also the sound.

In the language of the inventor, the following is the purpose of the invention:

In its broadest aspect, the invention contemplates the use of a diaphragm, and an actuating magnet located in front of the diaphragm or upon that side of the diaphragm at which provision is also made for the emission of the sound produced by the vibration of the diaphragm. In carrying out the invention I prefer, however, to use a pair of actuating magnets, one located upon each side of the diaphragm, the coils of the two magnets being so connected that when the attractive effect of one of the magnets is increased that of the other is reduced.

EDWARD SOKAL, OF CHICAGO, ILL., HAS BEEN GRANTED PATENT NO. 1,034,156 FOR A STORAGE BATTERY.

This invention relates to storage batteries, and presents some novel points. The inventor employs means of forcibly effecting circulation of the electrolyte through the pores of the active material of the battery electrodes, and on account of this the inventor finds it possible to greatly simplify a storage battery.

We give herewith part of the specification of this invention:

The structure of Figs. 3 and 4 resides in the construction of the nested porous cups, each of which in Figs. 3 and 4, is provided with an annular bottom, *r*, each resting upon the bottom *q* of the leaden outer case, each cup possessing also two concentric cylindrical walls *s*. Between each pair of walls *s* of each cylindrical cup, cylindrical leaden sheets *k* are inserted, which sheets are perforated so as to receive the active material k^3.

The nested porous cups in the structure of Figs. 3 and 4, are also so nested that annular spaces intervene between the same, in which annular spaces other perforated leaden plates *k* are inserted and in which latter annular

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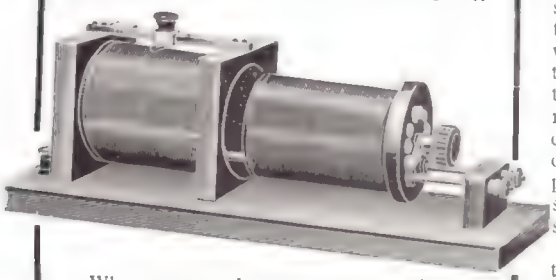

When you spend your money, get the best you can for it. Our No. 32 Loose Coupler is patterned after approved commercial types. Primary wound with bare wire on unshrinking core; Slider is mechanically perfect, touching only one wire at a time; Secondary is wound with silk wire on core mounted on two rods and slides into Primary without jamming—six taps taken off to switch. Perfectly constructed and well finished in imitation mahogany; brass trimmings. Extremely selective and efficient. **$6.00**

RECEIVERS—Our O. K. Phones are not rewound; they are specially wound to 1000 Ohms each. The only low priced phones with moulded case (eliminating induced currents) with magnet cores set therein, insuring permanent adjustment. More sensitive than many so-called commercial receivers. Guaranteed wound with copper wire to proper resistance. **Receiver only, $1.75 each. Set complete, 2000 Ohms, $5.00.**

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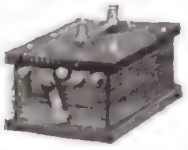

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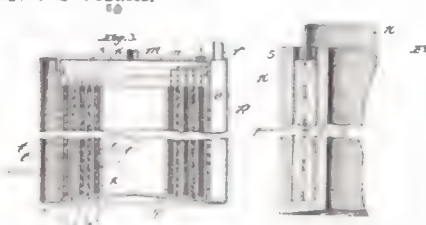
spaces active material k^2 is placed in a manner which has been described.

The active material entering into the construction of the positive electrode is more apt to work its way into the pores of the porous walls than is the material of the negative electrode. On this account, I interpose some filtering medium between the active positive material and the porous walls. I preferably employ as a filtering medium, thin sheets l, of wood, that are placed immediately next the porous walls. These wooden sheets act as screens or filtering medium, for the purpose stated.

I prefer the double wall cups, inasmuch as they permit the removal therewith of the positive electrodes without disturbing the negative electrodes.

By using pressure in connection with the battery structure herein described, I am enabled greatly to reduce the electrical resistance offered by the porous walls, inasmuch as the electrolyte within the porous walls is maintained at the maximum of its conductivity. It will further be noted that both surfaces of each electrode are subject to electrolytic action, each electrode surface having the surface of a complemental electrode facing it, excepting, of course, the outer and inner electrodes."

From the foregoing it will be seen that the inventor uses the pressure to transfer the electrolyte from one element to the other and, while the idea is ingenious, we no not know how it will work out in practice. At any rate it seems to us that unless the battery jars are made exceedingly heavy and strong, they will give way sooner or later with disastrous results.



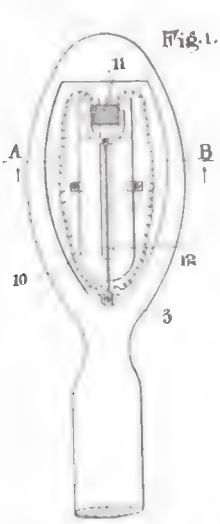
We also doubt that the circulation is very effective in such a battery, as we are very much afraid that the pores will become clogged after the battery has been in use for some time.

PATENT NO. 1,033,726, FOR AN ELECTRIC HAIR-COMB HAS BEEN GRANTED TO JOB THOMAS NIBLETT, OF STOCKWELL, AND WILLIAM H. CADWELL, OF LONDON, ENGLAND.

This invention relates to an electric haircomb and presents some novel ideas. The inventors generate their own current directly in the brush in a very ingenious although very inefficient manner. The current is generated by means of a small magneto shown at 11, Fig. 1. It is also shown diagrammatically at 10′ in Fig. 3. The idea is that when the brush is used, the backward and forward movement upon the head, moves the armature 10′ in the electromagnet 11′, thereby creating an electric current which is sent

through the induction coil 14, also through the condenser, 13. This current is then sent into the prongs of the comb, of which there are two sets as shown. There are also two sets of rollers 4, which assist in the combing movement, and saturated with some tonic preparation which is supposed to benefit the hair.

While we do not doubt that this outfit works, we are of the firm belief that the current generated must, at any rate, be in-



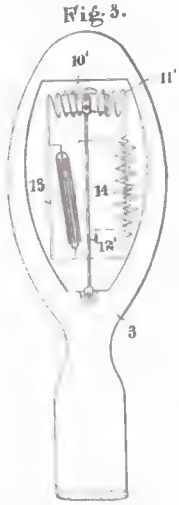


Fig. 2.

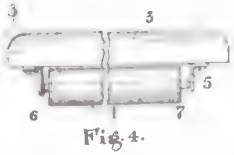


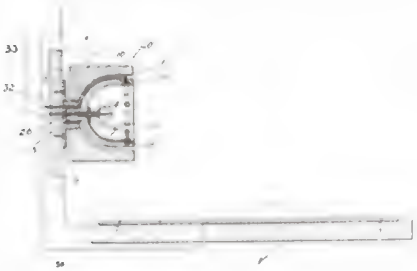
Fig. 4.

finitesimal. It is also always necessary to keep the comb in motion, and vigorously at that, if any current is expected from it.

PATENT NO. 1,034,212 FOR AN ELECTRIC TRAP HAS BEEN GRANTED TO KAROLY DEVICH, OF AKRON, OHIO.

Another rat trap!

It seems the rat trap is trying to run a close second to the much abused trolley wheel, as inventors all over the world seem to be bent on inventing the almost impossible rat trap. We have discussed so many rat traps in our past issues that we hardly think it worth while to again broach the subject.



Mr. Devich, as have other inventors, makes the same fundamental mistakes, the worst one in the present invention being that the dead

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body of the rat is not done away with. Thus, this rat trap, like the others, will probably electrocute one or two rats, and cannot be used again until the dead bodies of the rats have been removed.

The apparatus is supposed to work as follows:

The ground plate, 3, is mounted in such a manner that when the rat tries to take the bait, 25, its head comes in contact with the contact prongs, 17, which completes a circuit by means of the plate, and thus electrocutes the rat. At the same time, the current is supplied, also, to the bait itself, 25, which is supposed to help kill the rat. We think this latter arrangement is useless, as well as totally unnecessary.

PATENT NO. 1,033,228, FOR A DRY BATTERY CELL, HAS BEEN GRANTED TO JOHN W. BROWN, OF CLEVELAND, OHIO.

The objects of the present invention are: to decrease the internal resistance of a dry battery cell, and therefore to increase the current; and to more evenly distribute the current and therefore to cause the substantially uniform consumption of the zinc can, and a corresponding prolongation of the useful life of the cell.

The invention consists in the employment in a dry cell, which is otherwise like the dry cells in common use, of a negative electrode, made of carbon, graphite or any suitable mixture of the two, and having a core made of material having high electrical conductivity, preferably metal in the form of a centrally placed rod.

This is a good idea and if the carbon can be made non-porous we have no doubt that the idea will prove of worth in practice.

The inventor proposes to soak the carbon electrode in paraffine in order to prevent corrosion of the metal rod E. While this would effectively do away with corrosion, the surface resistance of the carbon will also greatly increase and the advantages gained by the rod E will be overbalanced by the high resistance between the polarizer and the carbon which is quite an important point to consider.

While the inventor does not specify any particular metal for the rod, E, we should think that lead, poured in the central opening of the carbon, would form quite an effective conductor, and inasmuch as lead is not corroded in the usual battery electrolyte, the idea is perhaps worth looking into.

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The October number will be issued September 25th and the last advertising forms close September 10th.

The November number will be issued October 20th and the last advertising forms close October 5th.

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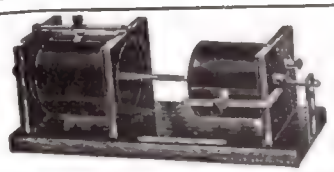

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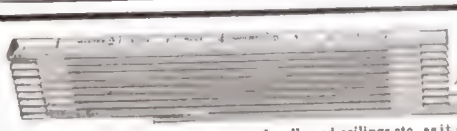

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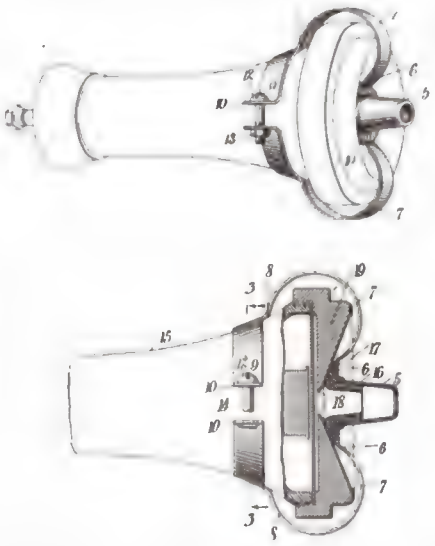
PATENT NO. 1,033,619, FOR A TELEPHONE ATTACHMENT HAS BEEN GRANTED TO JUSTIN E. ROSS, OF SPRINGFIELD, MO.

This invention relates to a telephone attachment, the idea being to provide an ear piece, 5, which can be clamped, by means of the clamp, 7, to an ordinary telephone receiver, in order that the sound waves will be shot directly into the ear of the listener.

We do not know where Mr. Ross got this



idea from, as, in itself, it is of little use and will hardly ever be used in practice. A strange part, however, of this invention, is that while, in itself, it is of little use, in combination with another invention which we print herewith, it becomes more or less useful.

WILLIAM A. SCHMELZ, OF PITTSBURG, PA., HAS BEEN GRANTED PATENT NO. 1,034,148 FOR AN ATTACHMENT FOR TELEPHONES.

We print this invention, not so much for the utility of same, as we do not think it will ever come into use, but for the purpose of showing how sometimes, unknown to each other, inventors work along very similar lines.

It will be seen that Mr. Schmelz uses an ear piece similar to that of Mr. Ross which we just described in the foregoing patent, and while the two inventions are somewhat different from each other, they achieve almost the same purposes. If Mr. Ross had thought to put a tube on his ear piece he would have the same invention as Mr. Schmelz.

We are convinced that the two gentlemen do not know of each other, and are equally sure that both have worked along the same lines to accomplish something which has been given up a long time ago as being not worth while.

There have been so many cumbersome and useless inventions heretofore on the same idea that we doubt if there will ever be invented something worth while.

Mr. Schmelz's invention is so clearly shown in our illustration that we hardly think it necessary to go into any details. We only wish to emphasize the fact that sounds con-

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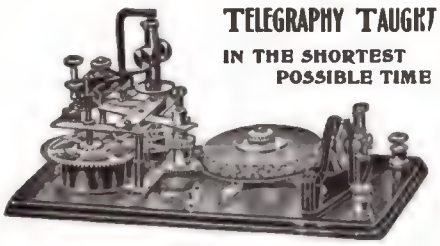

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We refer to this month's editorial which should be of utmost interest to every amateur in the United States.

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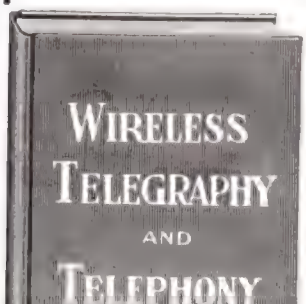

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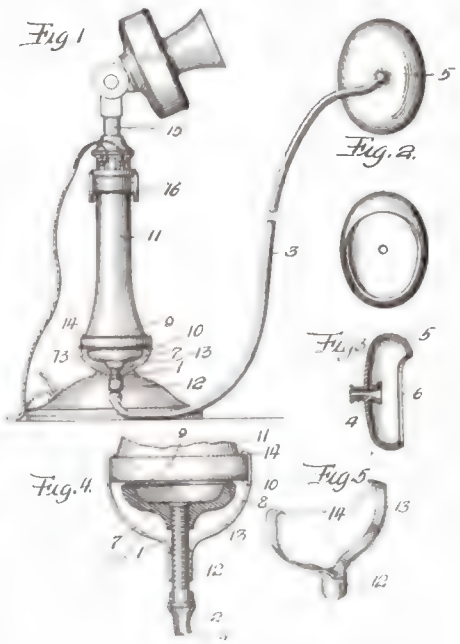
veyed through the rubber tube, 3, are greatly weakened when they have arrived at the ear piece, 5, and that such a device could surely not be used for long distance, or even in a

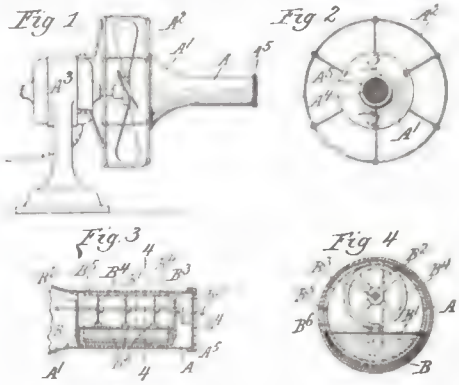


Metropolitan district when telephoning for a distance of over five miles.

PATENT NO. 1,034,777, FOR A FUMIGATOR, HAS BEEN GRANTED TO FRELING C. FOSTER, OF CHICAGO, ILL.

This invention relates to a fumigator, and is used to either evaporize perfume or antiseptic solution.

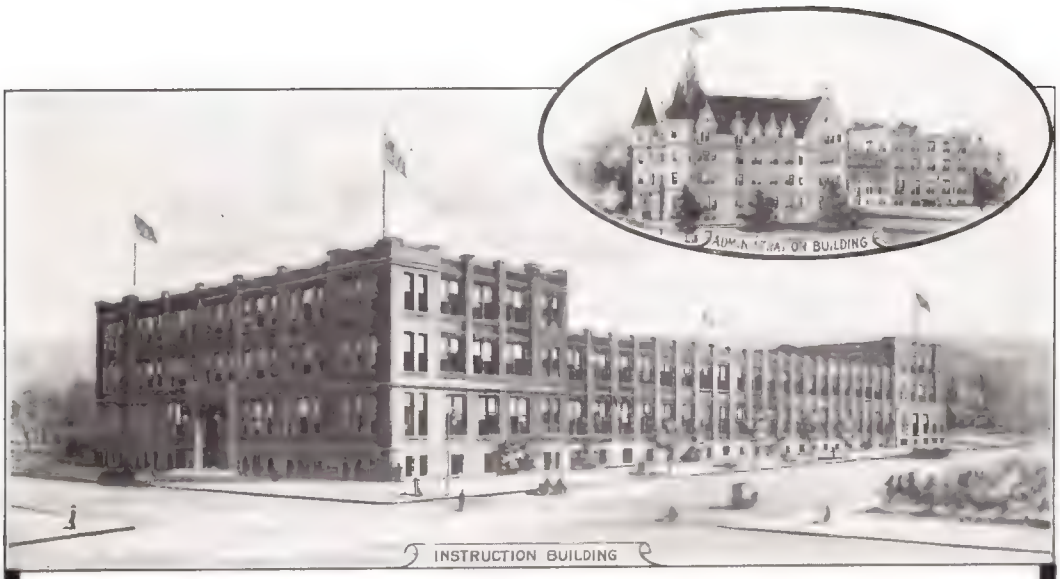
It will be seen that the funnel, A, is attached to an ordinary fan, and this funnel,



in the inside, contains the arrangement shown in Fig. 3, which the inventor describes as follows:

The cylindrical tube A which terminates at one end in the funnel A^1 is attached to the protecting cage A^2 of any suitable electric fan A^3 and closed at its other end by the screen A^4 carried within the removable cap

(*Continued on page 666.*)



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Wireman	Architectural Draftsman
Mining Engineer	Plumbing & Heating
Telephone Expert	Chemist
Surveyor	Bookkeeper
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Automobile Running	Civil Service Exams.
Agriculture	Salesmanship

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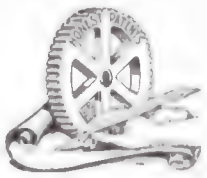

PATENTS

A Talk to the Inventor

When you get an idea, do not apply for patent because some one says it is patentable. *Certain details* make it patentable—find out *what* these are, and get copies of nearest resembling patents, so as to judge the value of your improvements.

Send Sketch of Your Idea for free advice, and I will send you valuable book of patent information that you ought to have; written so you can understand it. Services of the highest class.

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PATENTS THAT PAY. Contains fac-similes of unsolicited letters from our clients who have built up profitable enterprises founded upon patents procured by us. Also endorsements from prominent inventors, manufacturers, senators, congressmen, governors, etc.

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When writing, please mention "Modern Electrics."

Advice on Patents

MORE RAT TRAPS.

(59) M. R. Brown, of Cable, Ohio, sends in another design of a rat trap, which is the first one in a long time that has any merit.

We believe a patent might be obtained, and we would advise our correspondent to get in touch with some good patent attorney.

AUTOMOBILE REAR SIGNAL.

(60) Samuel Cohen, Brooklyn, N. Y., sends in a design of a combined automobile license number and rear tail lamp. He wants to know whether it is worth while taking out a patent, and if it will do for commercial purposes. The principal part of this invention is that at night the license number of the automobile will be seen plainly. There is also a danger lamp combined with the device.

A. This device is by no means new, as there are several on the market now. The idea, however, of showing the tail lamp in position, as given by our correspondent, seems to have some value and merit and it would be worth while to spend $10 on a patent search to find out if any similar device has already been covered.

WIRELESS TELEPHONE

(61) A. R. Coleman, Palmyra, Va., sends in a drawing of a wireless telephone connection and wishes to know if the device, as illustrated, gives an undamped wave.

A. The device shown is nothing but an ordinary spark coil system, and it is not possible, from the apparatus as shown, to obtain undamped waves.

Q. 2. Our correspondent also wishes to know what results he will obtain by arranging in a certain manner a number of piano strings and operating them by electromagnets in a certain manner.

A. 2. The idea certainly is curious, as well as novel, as we are quite sure we have never seen anything similar published before. At the same time we doubt whether the device is of any practical use, and unless our correspondent has a particular use for the arrangement in mind we hardly think it would pay to patent it.

MORE RAT TRAPS.

(62) Ivan C. Blickenstaff, Smithsburg, Md., sends in another device for a rodent exterminator which suffers all the faults described before. The same is true of the one sent in by Ben Herr, Jr., of Lebanon, Ind., the device being very impractical, while the one sent in by another correspondent, of Detroit, will surely not work at all.

To set clear in the minds of would-be rat trap inventors, let us state here, once and for all, the necessary requirements for the successful extermination of rats.

The trap should be placed in such a manner that it is easily accessible to the rodents. It must not be a cumbersome device. It must be cheap to manufacture, and should not retail higher than $1. It should work equally well on 110 volt A. C. and 110 volt D. C. current. It should not necessitate any batteries for its operation. The rat must be electrocuted quick-

(*Continued on page* 666.)

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REFERENCES

Lincoln National Bank.....Washington, D. C.
Little Giant Hay Press Co., Alma, Mich., and Dallas, Texas
Electro Importing Co.....New York, N. Y.
American Railway Appliance Co.....Oil City, Pa
Farmers' Mfg. Co.....Norfolk, Virginia
Griffin Mfg. Co.....New York, N. Y
Warsaw Paper Box Co.....Warsaw, N. Y.
Butler Engineering Co.....Akron, Ohio
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is impossible without a strong and valid patent. Defective patents will not "pass" these days. An invention may be worth millions but not a penny of profit can be actually derived from the same until after it is PROPERLY PROTECTED by patent.

Many paths lead to failure, but only one path leads to success. Why some inventors succeed where others fail is fully explained in my new book, "PATENTS AND PATENT POSSIBILITIES." Also tells what to invent and where to sell it. This interesting booklet will be mailed to any inventor upon receipt of 6 cents in stamps to defray postage.

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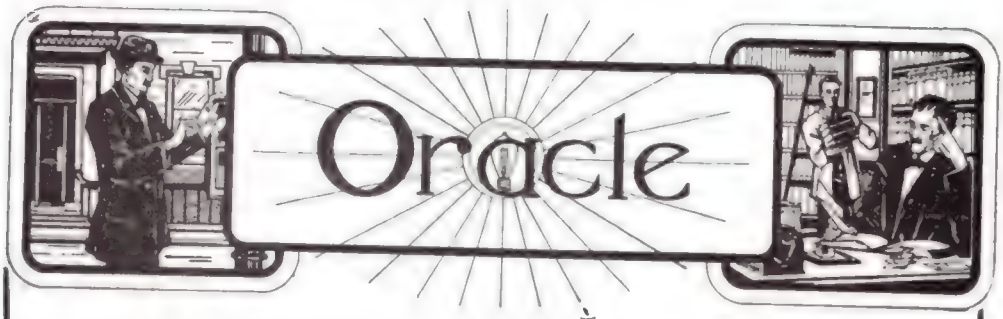

Queries and questions pertaining to the electrical arts, addressed to this department, will be published free of charge. Only answers to inquiries of general interest will be published here for the benefit of all readers.

On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing.

Common questions will be promptly answered by mail if 10 cents to cover expenses have been enclosed for each question. We can no longer undertake to furnish information by mail free of charge as in the past. There are as many as 150 letters a day now, and it would be ruinous for us to continue acting as a free correspondence school.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

NAME AND ADDRESS MUST ALWAYS BE GIVEN IN ALL LETTERS. WHEN WRITING ONLY ONE SIDE OF QUESTION SHEET MUST BE USED; DIAGRAMS AND DRAWINGS MUST INVARIABLY BE ON A SEPARATE SHEET. NOT MORE THAN THREE QUESTIONS MUST BE ASKED, NOR SHALL THE ORACLE ANSWER MORE THAN THIS NUMBER. NO ATTENTION PAID TO LETTERS NOT OBSERVING ABOVE RULES.

WE CANNOT ANSWER QUESTIONS REGARDING SENDING AND RECEIVING RANGES.

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

TELEPHONE WIRE AERIAL.

(2115.) Charles H. Dudley, New Hampshire, writes:

Q. 2.—We live in the country, and have a telephone of standard farmers' line equipment 2 m.f. condenser, small induction coil, a call bell, batteries, receiver and transmitter. Central is called by taking receiver from hook. When I connect the above instruments (in question) to the two binding posts on the bell they work nicely. When the detector point is pressing hard on the silicon a loud hum is heard, but with light pressure the humming stops and the static and wireless signals come in loudly. As nearly as I can follow out the wiring, one of the wires to the bell runs directly to the ground, the other comes from the condenser, the other side of which seems to go to one of the line wires. Will you please explain why this works as it does?

A. 2.—The telephone line wires act as an aerial, and there is no reason why your set should not work when connected to them and the ground. The editor of this column has done the same thing repeatedly.

Q. 3.—Is the company likely to object to my using their wires for wireless in this manner?

A. 3.—The company is not likely to object as long as your experiments do not interfere with the regular service and they do not know that you are doing it.

COHERER TROUBLE

(2116.) Le Roy Nelson, Alaska, writes:

Q.—I have purchased a Salbry-Arco vacuum coherer and find that I cannot receive intelligent signals with it. The tapper operates continuously when once it has started, whether there are any signals coming in or not. What is the trouble and how can it be cured?

A.—The trouble is due to the extreme sensitiveness of the coherer, the spark from the tapper magnet contacts being sufficient to break down its resistance as often as the tapper shakes it up, and this continues as long as the battery current is on. The remedy is to enclose the coherer in a metal box, leading the connections in through suitable insulating bushings, and to shunt all sparking contacts with high non-inductive resistances.

ELECTRIC WELDING.

(2117.) Ralph Marsh, Ohio, asks:

Q. 1.—Can the following metals be welded electrically, mechanically or electro-mechanically? They are zinc, tin, bismuth and copper.

A. 1.—They may be welded electrically or by means of oxy-acetylene blowpipe. The melting point of bismuth is very low.

Q. 2.—Can an electric furnace be used to smelt said metals to advantage?

A. 2.—Yes.

Q. 3.—How is the ratio of the number of turns in a step-down transformer calculated?

A. 3.—The ratio of the number of turns in the primary and secondary windings of a transformer is the same as the ratio between the primary and secondary voltages.

X-RAYS.

(2118.) Herbert Steet, Maryland, wants to know:

Q. 1.—If a person has an invention which is patented, can he make and sell it without a license?

A. 1.—You cannot make and sell a patented device without a license from the patentee unless you happen to own the patent.

Q. 2.—Kindly give hook-up for a sending

Auristophone No. 1 Magnifier

A loud sounder for telephone or telegraph with 4 Ohm reproducer.....$3.50

Long Distance with 75-150 Ohm reproducer..$4.00
175-200 " " ..$4.25
225-350 " " ..$4.50
400-625 " " ..$5.00

Auristophone Loud Speaking Telephone or Telegraph Reproducers

(Adapted to be Attached to Standard Horns)

Local, 4 Ohms $1.50
75-150 Ohm reproducer.....$2.00
175-200 " " $2.25
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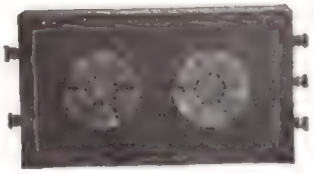
Auristophone Model A Loud Speaking Transmitters

	With Pushbutton	Without Pushbutton
4-7 Volts	$7.50	$7.00



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Single	$12.00	$15.00
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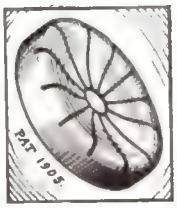
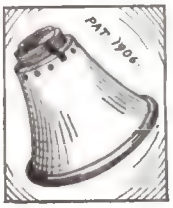


(Inside Thread Measurement of Ear Cap, 2¼" x 24 Thread)



(Outside Thread Measurement of Mouth Piece 15-16" dia. x 30 Thread)

Auristophone Telephone Attachments

(Made in size to fit Standard Bell Telephone and others)

The scientific discovery of Auristophone Kerfs and Vents has revealed the reasons, why common phones without them are not thoroughly acoustic, hygienic, or beneficial in effect.

They increase the efficiency of any telephone, improve the conditions of the organs of hearing and positively prevent injuries to the ear.

Introductory prices (to readers only) 50c per set.

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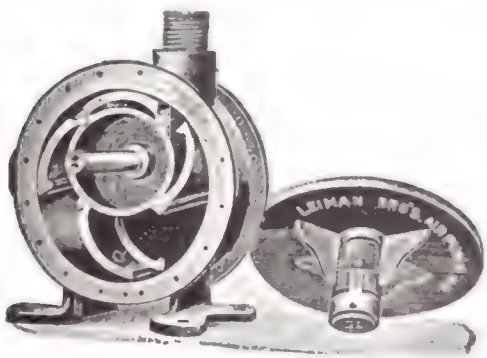
VACUUM PUMPS

for vacuum cleaning on small or large outfits. Very powerful, simply constructed. Can't get out of order.

A small vacuum cleaning outfit using Leiman Bros. vacuum pump

A commercial outfit with a Leiman Bros. vacuum pump using 8 horsepower.



The machines are adapted for experimental work and we have them as small as two cubic feet per minute. Also made gas tight.

Catalog No. 138 Blowers—139 Vacuum

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wireless using an Electro Static machine giving a 3" spark, instead of a coil? Kindly state the longest distance ever sent with such a machine?

A. 2.—This cannot be done successfully.

Q. 3.—If a 4" X-Ray tube is connected to one pole of the above mentioned machine, and the other pole of the tube, with the ground, can the bones of the hand be seen if a fluoroscope is used? Will the X-Rays work better with or without the leyden jars?

A. 3.—Yes. It will probably work better without the leyden jars, but you might try it both ways.

REWINDING A. C. FAN MOTOR.

(2119.) J. E. Newell, Idaho, writes:

Q. 1.—I have a Fort Wayne "Wood" A. C. Induction motor, wound for 110 volts, 133 cycles. Description is as follows:—armature (squirrel cage), 1 23/32 inches in diameter, 1 1/16 inches long; field, laminated, 4 pole O. D. 3⅜ inches, I. D. about 1¾ inches. This is a fan motor, designed to hang from the electric light socket, and turn in a horizontal direction while revolving. It is self starting, though no winding is used for this purpose. I wish to rewind it so that it will run on 60 cycle instead of 133 cycle current. Field is wound with wire like that enclosed. Kindly tell me of what size wire is required and how to wind it.

A. 1.—If the field has a distributed winding in slots, rewind it for a two pole winding instead of a four, using the same sized wire and crowding in about 10% more wire into the slots if possible. On the other hand, if the motor has four projecting poles it can probably not be wound to run at the same speed it did before, and will probably operate all right if used as it is except that it will run at about one-half its former speed. For any further particulars concerning the motor we would refer you to the General Electric Co., Schenectady, N. Y., who manufacture this motor. The sample of wire you sent us is No. 28 DCCC.

RECEIVING TROUBLES.

(2120.) Stanley F. Patten, New York, writes:

Q.—For over two years I have used the same aerial and ground and have obtained fine results, at times having heard as far as Savannah, Ga., also Norfolk Navy Yard and other stations within a range of about 700 miles. Recently, however, during painting and alterations of the exterior of our house I was forced to take down my lead-in and ground wire, which I had grounded on a metal leader on the side of the house. This leader was painted and I had to scrape the paint off before I could ground the wire again. My set is now connected in the same manner as before. The aerial is connected as before, with the exception of the number of wires being four instead of six, as before. When I am receiving now, I find that I receive about one-tenth as far as before, and that even nearby stations like N. Y., FNK, or OHX come in very faint. Once in awhile I hear them very loud for a minute or two, but in the very middle of a word or sentence the signals will suddenly stop altogether or else

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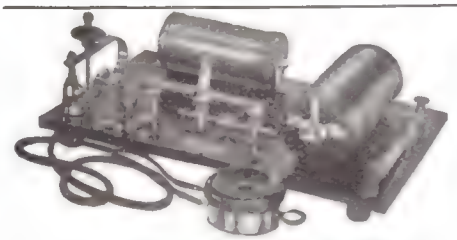
COMPLETE — PORTABLE

IDEAL SETS AT A PRICE YOU CAN AFFORD TO PAY



Mounted on solid oak base, size 7 x 12

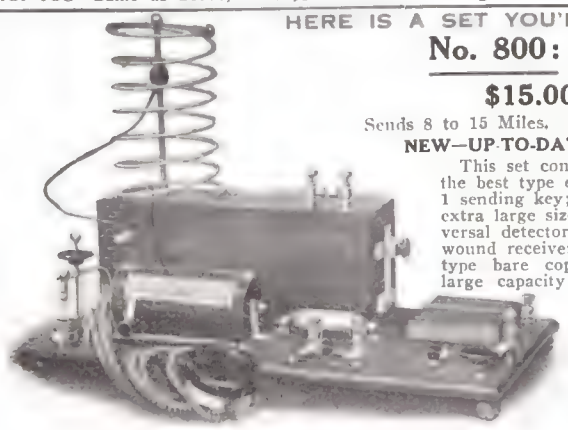
No. 796—$5 Value $3.90

Sends ½ to 1 Mile—Receives up to 500 Miles

This new, up-to-date, guaranteed, portable set, consisting of one ¼-inch spark coil, equal to the average ⅜-inch coil, and high tension vibrator, 1 combination universal detector; one 75-ohm, nickeled case, exceptionally sensitive telephone receiver and cord; 1 large high efficient flat plate secondary condenser; 1 sending key; 1 condenser switch; 1 spark gap with lathe turned ⅜-inch zinc spark ends; 1 tuner 4½ x 2 inches, latest type, wound with bare copper wire; 1 special primary condenser; 1-inch wollaston wire; 1 double throw double pole aerial switch; 120 feet aluminum aerial wire; 2 insulators, complete directions. The raw material alone would cost you this amount were you to build the set yourself. *Operates on two batteries*.....Price.....**$3.90**

No. 798—Same as above, with ½-inch coil. Sending radius 1 to 2 miles. Price.....**$5.00**

HERE IS A SET YOU'LL BE PROUD TO OWN



No. 800: $8.50

$15.00 Value

Sends 8 to 15 Miles. Receives 600 to 800 Miles

NEW—UP-TO-DATE—GUARANTEED

This set consists of a guaranteed 1-inch spark coil, the best type ever placed on the market for wireless; 1 sending key; special flat plate secondary condenser, extra large size; primary condenser; combination universal detector; very fine 1000 ohm, silk copper wire wound receiver and flexible receiver cord; the newest type bare copper wire wound tuner, exceptionally large capacity; spark gap with lathe turned 3.8-in. zinc ends; 1 condenser switch; 120 feet aluminum aerial wire; double pole; double throw switch; 2 insulators; 1-inch Wollaston wire; proper capacity sending helix; 8 to 15 miles sending. 600 to 800 miles receiving. Regular $15.00 Value. *Operates on 6 batteries.* Price complete.....**$8.50**

Mounted on solid oak base, size 8½ x 16 inches.
Equipped with 2,000 ohm Receivers and Headbands.....**$11.60**

For the Beginner

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No. 797..... $2.50 VALUE..... **$1.75**

Receives up to 500 Miles

This consists of a combination universal detector; 75 ohm nickeled case, exceptionally sensitive receiver and telephone cord; tuner 4½ x 2-inch latest type, wound with bare copper wire; 1-inch Wollaston wire; 2 insulators; 65 feet aluminum aerial wire. **Price**.....**$1.75**

Equipped with 1,000 ohm 'phone..... **$2.70**

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No. 200	¼	in. coil	**$2.00**
No. 201a	⅜	" "	**3.00**
No. 201b	½	" "	**3.30**
No. 201c	¾	" "	**3.65**
No. 202	1	" "	**3.95**
No. 203	1½	" "	**5.50**
No. 204	2	" "	**7.75**
No. 205	3	" "	**15.50**
No. 206	4	" "	**25.00**
No. 207	6	" "	**50.00**
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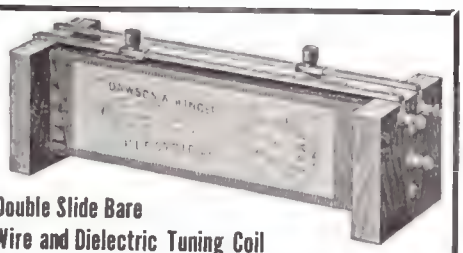

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Through carelessness or inefficient receiving apparatus it is an easy matter for the listener to throw away what may practically represent one-fourth and even more of the initial energy of the sending station with which he may be endeavoring to get into touch. Such thoughtlessness reminds us of the story of "Darius Green and His Flying Machine." Darius, as you know, was so very confident in his ability to fly that the matter of a little extra weight was a "mere trifle," so in sheer braggadocio he donned an iron kettle for a hat and then made his ignominious plunge from the top of his father's barn.

We do not venture to infer that he could have flown had he not worn an iron kettle for a hat, but his humiliation would have been lessened somewhat had he not done so.

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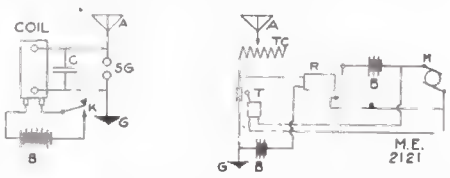
become too faint to read. I don't think it is the fault of the detector, but would be glad to receive your advice in the matter.

A.—We think the trouble is probably in your ground connection. In all probability paint has gotten into the joints in the leader pipe to which you attach your ground wire, and it may be possible that the joints have been loosened during the alterations. Loose joints in your ground connections would account for the erratic work of your set. You might try a temporary ground on a gas pipe or water pipe near your instruments, and if the signals then come in loud, go over the whole of your regular ground connection or put in a new one.

HOOK-UP FOR WIRELESS CONTROLLED BOAT

(2121.) Walter Dziadik, Connecticut, wants wiring diagrams for the sending and receiving circuits for the wireless controlled boat in No. 2012 in the June Oracle. He also wants to know where he can buy the instruments.

A.—Diagram herewith. The instruments can be bought from any of the advertisers in our magazine.



THEORY OF LUBRICATION VS. ELECTRIC CONTACTS IN OIL.

(2122.) Edward W. Hutchinson, Michigan, says:

The general theory of lubrication is, that a film of oil between the two bearing surfaces prevents the said surfaces from coming in actual contact. If this were so, how could a current be passed through an oil break switch? It might be possible that in the larger type, where high tension currents are handled, the current might break down this film, thereby establishing a contact, but in a small instrument, for instance, a buzzer, I use for a test with an old dry cell, immersed in transformer oil, it would seem that such low voltage and small current would not be able to break down the film which would form between the vibrator and adjusting screw, so, to my mind, the pressure of the two metals must force the oil from between them, thereby forming a metallic contact, which would upset the theory of lubrication. Your explanation to this apparent phenomenon would be greatly appreciated.

A.—The reason that the buzzer works is that the pressure between the contact spring and the fixed contact is sufficient to press the oil out or at least to reduce the thickness of the oil film to a point where it no longer stops the current; also, when the buzzer is in operation, the spark carbonizes the oil in the immediate vicinity of the contacts, which, of course, reduces its insulating property. If you have had any experience with machinery you probably know that a running bearing continuously carries a film of oil into the space between the shaft and the bearing, also that

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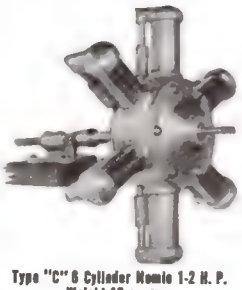

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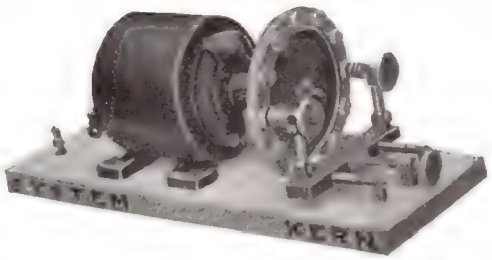

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a machine which has stood some time requires considerably more power to start it than is necessary to keep it running. This is due to the fact that the shaft when standing still squeezes the oil out and allows the two surfaces to come together.

UMBRELLA AERIAL.

(2123.) Whitford Boyce, Illinois, sends us a sketch of an aerial system composed of two four-wire umbrella aerials attached to the same pole, the upper one consisting of four wires 90 feet long and attached to the pole 55 feet above the ground, the lower one consisting of four wires 65 feet long, the lower ends attached to the same stakes as the upper aerial and the upper ends attached to the same pole, thus bringing the lower aerial inside the upper aerial, and wants to know how to use these aerials to the best advantage.

A.—The best thing to do in this case is to break the wires composing the lower aerial up into short sections by means of insulators and use them for guy wires, only using the upper aerial alone. If an attempt to use either of the aerials separately be made, the one not in use will absorb most of the energy radiated from the other, while if they are both used together the difference in their wave lengths will lead to interference between the waves sent out, which will result in inefficient work.

SENDING CONDENSER. AERIAL AND LEAD-IN INSULATION.

(2124.) Chester Fuss, New York, inquires:

Q. 1.—How many plates 8 by 10 inches, with tinfoil sheets 5 by 7 inches on each side, and to be held in a rack, will be needed for a condenser for a ½-k.w. transformer?

A. 1.—About 78 plates will be required in two condensers connected in series across the secondary terminals of the transformer.

Q. 2.—How many porcelain cleats should be used in series for insulation on aerial for a ½-k.w. transmitting set?

A. 2.—Three or four cleats connected in series should be sufficient.

Q. 3.—I now have my lead-in insulated with a porcelain tube passing through the window sash into our house. The wire is No. 8 double insulated. How would I have to change my lead-in if I get a ½-k.w. transmitter?

A. 3.—Use a porcelain tube having a ¾-inch bore, and fill the space between the wire and the wall of the tube with some good insulating compound, such as is used for filling the boxes of spark coils, or else build up the wire, using rubber tape to fill up the hole through the tube.

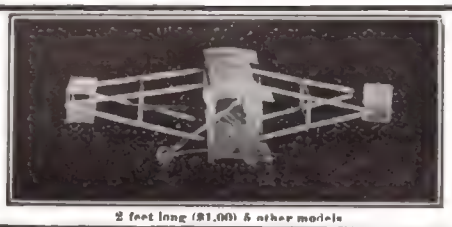
AERIAL AND GROUND.

(2125.) Richard Lewis, Connecticut, wants to know:

Q. 1.—Would a lead-in running at right angles to the vertical portion of a flat topped aerial materially lessen my range in receiving or in sending?

A. 1.—The horizontal lead-in will not affect the efficiency very much unless it is long or runs under or over and close to a grounded metal roof.

Q. 2.—If to connect your aerial to the water pipe, as stated in the Underwriters' Rules for Wireless Installation, you would have to run



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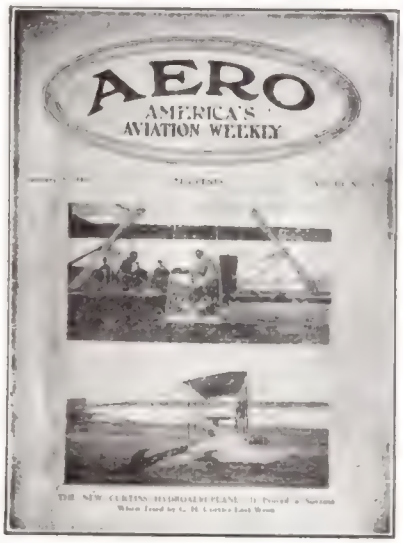

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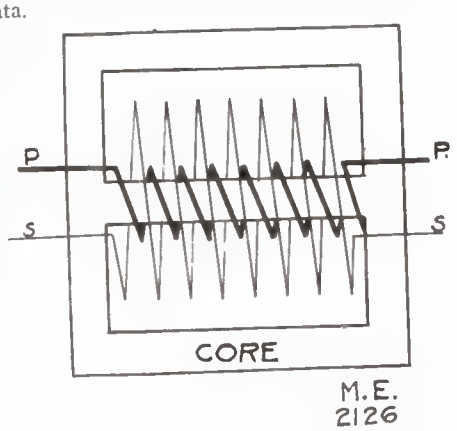
your wire along the house and make several turns, would it be all right to connect it to a large zinc sheet buried in the ground instead?

A. 2.—The zinc plate should be satisfactory if it has an area of at least 10 square feet and is buried in permanently damp earth.

SHELL TYPE TRANSFORMER.

(2126.) Ford H. MacElvain, Indiana, writes

Q. 1.—I have found small transformers wound as per sketch very efficient. Would you advise that a ½-k.w. transformer be wound after this fashion? If so, please give data.



M.E. 2126

A. 1.—If the transformer is to be used for power apparatus it is best to construct it in the manner indicated, but if it is to be used as a wireless transformer we do not recommend this form, for the reason that a considerable amount of trouble, through arcing at the spark gap, is met with unless some current controlling device is wired in the primary circuit.

Q. 2.—How are the number of turns on primary and on secondary on step-up and step-down transformers found?

A. 2.—See answer to 2117.

CONNECTIONS OF OSCILLATION TRANSFORMER.

(2127.) Carlton Van Duyne, New Jersey, asks:

Q. 1.—Would you kindly inform me whether or not there are any sliders or binding posts on the oscillation transformer described in the supplement to the June MODERN ELECTRICS?

A. 1.—No binding posts or sliders are provided on these instruments. The best method of making connections to the ribbon is to make up a clip similar to the jaws of small DTDP switches and attaching a handle to same similar to that used on these switches. These handles and switch jaws may be purchased from most any electrical supply house.

Q. 2.—Where do you connect impedance coil in circuit to keep lights from jumping?

A. 2.—The impedance coil is connected in series with the key and primary winding of the transformer.

Q. 3.—Would you please tell me where I can purchase copper ribbon for oscillation transformer?

A. 3.—From the U. T. Hungerford Brass & Copper Works, 497 Pearl street, New York.

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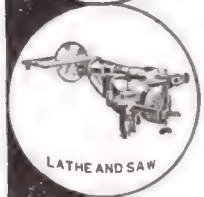

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SULLIVAN RECEIVERS. RECEIVER DIAPHRAMS.

(2128.) Edward B. Duvall, Maryland, inquires:

Q. 1.—Is the Pacific Wireless Telegraph Co. still operating their stations? If so, where are their stations, and what system do or did they use?

A. 1.—This was one of the early wireless telegraph companies and is no longer in business. They had no particular system in connecting their apparatus.

Q. 2.—Where can one purchase a pair of Sullivan wireless receivers? I have heard they are most sensitive; if not, what are the most sensitive ones and where can they be had?

A. 2.—We have had no experience with Sullivan phones, but are informed by persons who have tried them that they are about equal to the Brandes Navy Type receivers. Sullivan phones may be obtained from the Wireless Specialty Apparatus Co., 81 New street, New York City.

Q. 3.—Will the E. I. Co. sell the thin diaphragm that they use in their new Government phones, and will the diaphragm of the Government phones fit the professional transatlantic phones?

A. 3.—The E. I. Co. will sell the thin diaphragm used in their Government phones at 10 cents each. These diaphragms will not fit the professional transatlantic phones.

TRANSFORMER WINDINGS.

(2129.) A. B. Werner, Illinois, writes:

I have a secondary which I intend to use on a closed core transformer, but have had several arguments concerning the capacity of the secondary and would like to have your opinion of it.

The secondary consists of 40,000 turns of No. 30 magnet wire wound on a square form to fit on a 2½ by 2½-inch core. Have been told that this should carry ½ to 1 ampere all right. Now, here is the question: Supposing a primary of 250 turns of wire were used, the power coming from the lighting circuit of 110 volts. From the ratio of turns about 22,000 volts would be expected from the secondary. (Consider 250 turns of the primary to pass 10 amperes.) Now, suppose another layer of 250 turns to be connected up in parallel with the first, thus passing 20 amperes. Have been told that this will not change the secondary voltage much, but increase the secondary amperage. With the first layer, suppose we get 1 k.w. output, or 22,000 volts, at 1/22 of an ampere (with 500 turns, 1/11 ampere). Here is what I want to know: Can I keep crowding on primary till the secondary comes up to its capacity of 1 ampere, or will some other factor make this impossible?

A. 1.—No. Adding turns to the primary winding in this manner simply reduces the resistance of and the copper loss in the primary winding and increases the secondary output very slightly. The reason for this is that the additional turns connected in parallel with the original turns have the effect of increasing the size of the primary turns without changing their number. The current in the primary winding, and also that in the secondary, depend principally on the product

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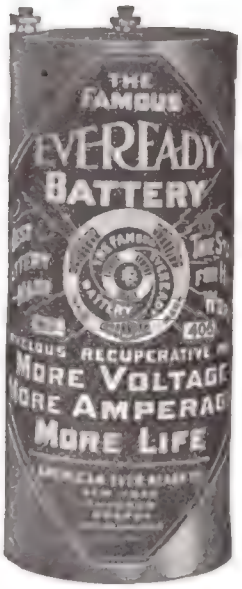

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of the total magnetic flux in the core and the actual number of primary turns, and, as previously stated, very little on the resistance of the primary winding.

Q. 2.—Also, what is the greatest possible output for this secondary, assuming a core 22 by 16, outside dimensions, with 2½ by 2½ cross section?

A. 2.—This core is large enough for a 3 or 4 k.w. transformer, while the secondary wire is only big enough for a 2 k.w. transformer.

Q. 3.—Can a rotary gap be run too fast? Mine runs 3,400 and has 24 points. When running about half speed it gives the spark a fine pitch, but as the speed increases the spark seems to hiss. The points are 1 inch apart on a 9-inch disk.

A. 3.—The rotary spark gap should not hiss if the movable plugs are all of exactly the same length, and gap runs perfectly true, and the sending condenser is properly proportioned to the number of sparks per second given by the rotary spark gap. Perhaps the hiss is only imagined, and seems to be heard at the sending end, while not being noticeable at the receiving end; or, on the other hand, perhaps there is an interference tone, due to that of the 60-cycle discharge and the high pitch due to the high frequency spark at the gap. Under certain conditions this may produce a hissing sound.

TUNING COIL WINDING.

(2130.) Fred Aicker, Illinois, says:

Q. 1.—I have an aerial about 50 feet long, 7 wires. In connection with this I have made a tuning coil containing 85 feet of wire in 114 turns. Is this enough wire in connection with the aerial I have? Enclosed find sample of wire I use.

A.—With your aerial you need a tuning coil containing considerably more wire than you have. You had better rewind the tuning coil, using No. 22 or No. 24 wire instead of No. 14.

INCLINED AERIAL.

(2131.) Ralph O. Terey, Missouri, says:

Q. 1.—While reading the July issue I noticed in an answer to one of the questions that you say that the actual radiation takes place in a direct perpendicular to the lead-in (if vertical). Now, would like to know what takes place on a slanting flat top aerial which has the lead-in from the lower end? With this type of aerial would it not be better to have a vertical lead-in from the highest part of the antenna?

A. 1.—The useful radiation takes place, as stated, in a direction perpendicular to the vertical lead-in. This sends out waves containing a static component which acts in a vertical plane and a magnetic component acting in a horizontal plane. Waves of this type are persistent. On the other hand, the horizontal part of the aerial or the horizontal lead-in radiates a wave having a magnetic component acting vertically and the static component horizontal. These waves soon lose their energy and die out before they have travelled very far. In an inclined aerial radiations also take place in a direction perpendicular to the plane of the aerial, and the more nearly the aerial approaches the vertical the more efficient it is as a radiator of useful energy. The

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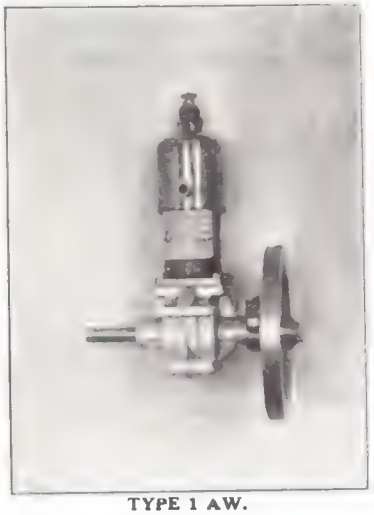

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lead-in should always be taken from the lower end of the aerial, and not from the high end, for the reason that as the current travels up the lead in, it travels down the aerial, and the waves radiated from the two, being of opposite polarity, interfere with each other, which results in inefficient work.

Q. 2.—Supposing we have an aerial 100 feet long and 75 feet at one end and 35 feet at the other, with a horizontal lead 25 feet long. Now, how would it do to hang wires every two or three feet from the antenna down to about 20 or 30 feet of the ground, thus making the aerial look something like a huge comb with its teeth to the earth?

A. 2.—This aerial would not be efficient for the reason just stated.

Q. 3.—Can you tell me some way for cleaning and preserving perikon crystals?

A. 3.—They may be cleaned by washing with wood alcohol. Detectors have been built in which the zincite crystals were either oil treated or immersed in oil, but we do not know whether they were successful. You might experiment along this line.

FLICKERING LIGHTS.

(2132.) R. H. Hughes, Oregon, inquires:

Q. 1.—Will you please tell me what 200 metres would be equal to in miles? (See fifteenth amendment to Alexander Wireless Bill.)

A. 1.—Two hundred metres is one-eighth of a mile, very nearly.

Q. 2.—If there is a transformer connected to the wires running into your house, would it be necessary to connect another for my station?

A. 2.—Yes. Your outfit would make the lights in our house flicker if connected to the same transformer.

RECEIVING TROUBLES.

(2133.) Howard Mowry, Minnesota, states:

Q. 1.—I have a wireless outfit consisting of the following: Sending: ¼-kw. transformer; helix, close coupled; plate condenser of 24 plates 8x10, with tinfoil 6x8; and key and spark gap. Receiving: Close coupled tuning coil, 2 slides; condenser which has 160 square inches of tinfoil; ferron detector, and 1,000 ohm receivers. Aerial: Four copper wires, 50 feet high and 100 feet long. I have not tried the sending apparatus yet because I have no means of operating the transformer. The receiving set works O K with the buzzer test, and I can hear static, but nothing from the nearest station, 15 miles away. What do you think is the matter? I have an iron pole on the roof and the other end of the aerial is suspended in a tree.

A. 1.—The trouble may be due to any one of a number of causes. Your condenser is too big. The detector may not be properly adjusted (these detectors are hard to get into sensitive adjustment, but are said to retain it when once obtained). Your ground connection may be poor. The iron pole may be grounded, in which case it would absorb considerable of the energy in the incoming waves. The station may be one of the Federal Wireless Telegraph Company's stations using the Poulsen system, the messages from which can not be heard with an ordinary wireless set.

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See article on the Poulsen system in the April issue.

AERIAL WAVE-LENGTH.

(2134.) H. P. Jellison, Maine, wants to know:

Q. 1.—Which of two aerials would have the longer wave-length, one made of 8 wires 75 feet long and all connected in series, leads taken from the ends and brought down to the window, or one made of two wires, using the same wire and connected similarly, that is, one piece from the window up one lead, and one wire across the far end and back along the other wire and down to the window again?

A. 1.—If the total amount of wire in both aerials is the same, the latter should have the longer wave-length.

Q. 2.—Would the wave-length of an aerial having four wires, all connected across at each end, be the same as one of the same length having eight wires connected across at each end?

A. 2.—This depends on the spacing of the wires. If the same distance between wires is preserved the eight-wire aerial should have a slightly longer wave-length.

Q. 3.—What is the meaning of wave-length of an aerial? Is it the distance the energy travels from the aerial during one alternation of the sending current, that is, when one spark jumps it travels so far before another jumps?

A. 3.—No, that is not quite right. It is the distance the wave travels during one complete period of oscillation of the high frequency current surging up and down the aerial. In other words, it is the distance travelled from the time the current in the aerial flows up until it flows up again, it having flowed down in the meantime, or vice versa.

WIRELESS WITHOUT AERIALS.

(2135.) J. J. Ruiz, Cuba, writes:

Q. 1.—I was experimenting with wireless in the yard of my home, the two little sets being about 100 feet apart. The receiving set consisted of a silicon detector, 200 ohm phones, a fixed condenser, a little single slide tuner; the sending set, two test tube leyden condensers and a medical coil. The ground connection was made, in both cases, to the water pipe, and the aerials were about 20 feet high. The signals were very loud, and when I disconnected the aerials they were the same; but when I disconnected the ground connections they were inaudible. Can you explain why the aerials were unnecessary?

A. 1.—The water pipe formed a direct connection between the two sets, and the current flowing between the sending and receiving condensers effected the transmission. You cannot work wireless sets without a ground connection, or its equivalent, in the form of a counter-poise capacity. See Dr. Tesla's article in this issue.

Q. 2.—Do you think a little generator, 5 volts, 6 amperes, would successfully operate a one-inch spark coil?

A. 2.—Yes.

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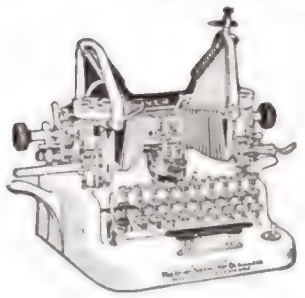

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WIRELESS TELEPHONE.

(2136.) Edward Werner, California, inquires:

Q. 1.—Is the wireless telephone hook-up, Fig. 7, on page 9, of the book "The Wireless Telephone," by H. Gernsback, a good one? Could I send a distance of 10 to 15 miles with it, using all the instruments described therein?

A. 1.—Yes, this is a good hook-up, and you can probably send 10 to 15 miles with it if the aerials are of sufficient size and proper receiving instruments are used.

Q. 2.—Is the hook-up, Fig. 29, on page 38, a better one? If so, why?

A. 2.—No, it is not as good.

Q. 3.—Where should an ammeter be inserted in each diagram?

A. 3.—In the aerial or ground lead.

60 CYCLE APPARATUS ON 50 CYCLE CURRENT.

(2137.) Ernest G. Underwood, California, asks:

Q. 1.—Can the E. I. Co.'s ½-k.w. transformer coil be used on 110 volts, 50 cycles?

A. 1.—Yes, if an electrolytic interrupter be used, or some form of current controlling device be connected in series with the lighting current if the electrolytic interrupter is not used.

Q. 2.—Can you use a 110 volt, 60 cycle motor on 110 volts, 50 cycles with good results?

A. 2.—Yes; but if the motor is of the induction type it will run at about 5/6 its former speed and deliver less power.

Q. 3.—What sized glass plate condensers would you recommend for the ½-k.w. transformer coil?

A. 3.—About six plates 8x10 inches, with tinfoil 6x8 inches.

INTERFERENCE.

(2138.) Walter W. Patzke, Wisconsin, says:

Q.—I have an aerial 50 feet high, 60 feet long, of the "T" type, made of No. 12 aluminum. There is a trolley line two blocks distant from my station. When receiving from long distances, and a trolley car passes, I am completely shut out. What do you think is the trouble? I have two fixed and two variable condensers in circuit. The variable condensers have seventeen plates each.

A.—Your aerial is probably parallel with the trolley road. The noise is due to induction or sparking from the motors or trolley wheels. Adding condensers to your set won't help you. Swing your aerial around so it is at right angles with the trolley road and you will find the trouble will be greatly lessened, if not entirely done away with.

DOES STATION COMPLY WITH WIRELESS LAW?

(2139.) Calvin J. Des Portes, Georgia, writes:

Q. 1.—My receiving set comprises the following: Three slide tuner, two fixed condensers, one variable condenser (seven-plate type), two detectors, two-point switch, a pair of 2,000 ohm receivers, and a DPDT switch for changing over from sending to receiving and vice versa. My antenna is composed of

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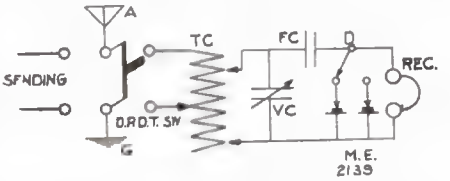
four strands No. 14 aluminum wire, 100 feet long and 55 feet high. With the above set should I be able to receive from the commercial station at Savannah? Please give hook-up.

A. 1.—We cannot say definitely whether you should or not. Under ordinary conditions, if your apparatus is properly adjusted, you should be able to work this distance; but there may be some good reason why you don't. Hook-up herewith:



Q. 2.—My instruments are only 25 to 30 feet below my antenna. What is the wave-length of such a station and antenna? Does it comply with the Alexander Bill?

A. 2.—The natural wave-length of your aerial and lead-in is about 160 metres. If your ground lead and the secondary of your sending oscillation transformer do not add more than 40 metres to this you are safe, as far as wave-length is concerned. However, the Government inspector, when he looks your station over preparatory to issuing you a license, will probably tell you what changes it will be necessary for you to make in order to comply with all the provisions of the law.

Q. 3.—Can a Kincaid coil, made to operate X-ray apparatus and Geissler tubes, be used for wireless transmission?

A. 3.—We do not know. If the coil gives a two-inch spark, or over, it probably may be used satisfactorily for short distances.

TUNING COIL WAVE LENGTH. DETERIORATION OF WIRELESS CRYSTALS.

(2140.) Edward Cummings, Rhode Island, asks:

Q. 1.—In the January, 1911, issue, query No. 838, you gave a formula for finding the wave-length of a tuning coil; then, in the August, 1912, issue, query No. 2083, you stated that a tuning coil has no wave-length of its own and it is useless to try to figure it. Which is correct?

A. 1.—The latter is correct. The formula referred to is simply the length of wire on the coil, multiplied by four, and then reduced to metres. This formula is roughly correct for the wave-length of a straight wire suspended in space, but has no bearing on a tuning coil. To illustrate, the editor of this column has a loose coupler, the primary of which contains about 170 feet of wire, the wave-length of which, according to the formula, would be about 206 metres. This is connected to an aerial the natural wave-length of which is about 200 metres. The combined wave-length of the two should be the sum of these quantities, or 406 metres, *but it is not*, for this aerial and loose coupler primary *tune up to 1,500 metres without the addition of any other apparatus*. We trust this will illustrate the futility of trying to compute the wave-length of

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a tuning coil and that our readers will not waste time in asking us to figure the wavelength of their coils, or to give them a formula for doing it.

Q. 2.—Is wrinkled tinfoil useless for making fixed condensers?

A. 2.—No, not quite useless; but the capacity of the condensers so made is very small, owing to the fact that the tinfoil does not make intimate contact all over the surface of the insulating material used as a dielectric, but only touches it in spots.

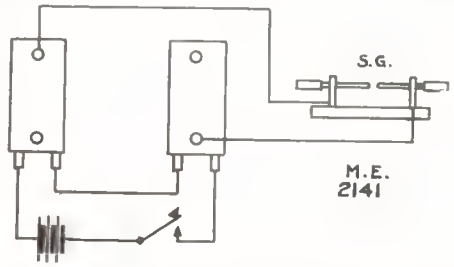
Q. 3.—Do wireless crystals keep their sensitiveness indefinitely?

A. 3.—Some crystals, like carborundum, seem to last indefinitely, while others, such as zincite, deteriorate to such an extent that they become practically useless after about six months' use.

SPARK BETWEEN TWO COILS.

(2141.) John Doe, Ohio, asks:

Q. 1.—Why was it that I obtained a spark when I had two spark coils connected as per diagram herewith? One of them was a ¼-inch coil and the other a 1-inch?



A. 1.—The two coils may have acted like two leyden jars connected in series, the primaries forming the inside, and the secondaries the outside coatings in each case, or the insulation between the primaries and secondaries may have broken down, the circuit being completed by the current jumping between the primaries and the secondaries.

Q. 2.—Would the pipe of a driven well 25 feet deep make a good ground for wireless?

A. 2.—No; it has not sufficient contact area. Ground connections require at least 10 square feet of surface in the ground plate.

Q. 3.—Would the current from a 1-inch, plus a ¼-inch spark coil kill a person? If not, how much would it take?

A. 3.—If the contacts between the person and the secondary circuit were sufficiently good to allow the coil to send a current of about 1/40 ampere through the body the shock would probably be fatal.

ONE INCH COIL ON 40 VOLTS OR MORE.

(2142.) Bernard Wexler, Pennsylvania, writes:

Q. 1.—The Gernsback electrolytic interrupter is designed to operate on a potential of 40 volts or over. Now, what I would like to know is, when the interrupter is connected to a 1-inch coil, on which not more than about 10 volts is ordinarily employed, why will it not break the coil down?

A. 1.—The interrupter limits the primary

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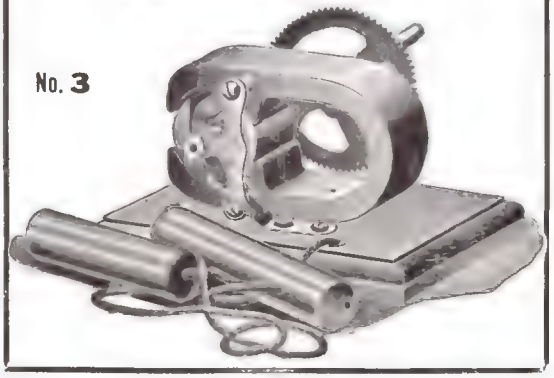

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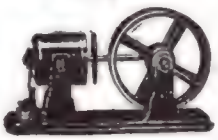

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current to a value that may be safely used with the coil.

Q. 2.—What is meant by a phase?

A. 2.—This is an electrical term used in connection with A. C. power transmission lines and apparatus, to denote different parts of a generator, or motor winding, or a transmission line, in which the currents are out of step with each other or with their respective voltages, as in a two-phase machine or circuit, etc. On the other hand, the word may be used in place of the word "step" in the preceding sentence, and we then have the somewhat mystifying statement: That the currents in the different phases of the winding or circuit are out of phase with each other, etc.

Q. 3.—What will prevent a vibrator from sticking?

A. 3.—Use less current or heavier contacts.

LOCATING BREAK IN SUBMARINE CABLE.

(2143.) George C. Drake, Iowa, wants to know:

Q. 1.—Suppose the copper core of a submarine cable should part at some point out in the ocean, without any damage being done to the outer sheath of gutta-percha, how do they find the location of the fault by tests at the shore end?

A. 1.—The copper core of a cable has a certain capacity with respect to ground per mile of cable. By measuring the capacity to ground of the parted cable, and dividing this by the capacity per mile, the distance to the break is easily found.

Q. 2.—With what style of antenna can a person send and receive equally well in all directions?

A. 2.—With either a plain vertical aerial or one of the umbrella type.

Q. 3.—Can you tell me the average salary given to wireless operators?

A. 3.—Marconi ship operators receive $30 to $70 per month, with meals and sleeping quarters; shore operators, $60 to $100 per month, with sleeping quarters. The National Electric Signaling Company (Fessenden system) ship operators get $30 to $60 per month, and shore operators $60 to $100. The United Fruit Company pays ship operators $50 to $75 per month; shore operators, $75-$150. and engineers for running gas engines at shore stations, $75 to $125 per month.

TRANSFORMER LIMIT.

(2144.) Earl Jimmes, Wisconsin, inquires:

Q. 1.—Can an amateur use a 3-k.w. transformer, as described in "Construction of Induction Coils and Transformers"?

A. 1.—No. See the fifteenth and sixteenth paragraphs of the Alexander Bill, as given in our May issue.

Q. 2.—Please give diagram for doing long distance sending and receiving with the following apparatus: Sending: ½-k.w. closed core coil, ½-k.w. condenser, rotary spark gap, oscillation transformer as per supplement to June issue *Modern Electrics;* DPDT switch. Receiving: Loose coupler, 1,500 metres tuning coil, fixed condenser, silicon, perikon, electrolytic and carborundum detectors, four-point switch, circular potentiometer, and 2,000 ohm

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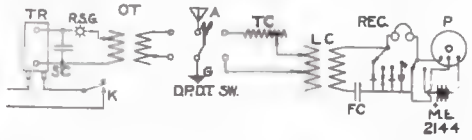

OPERATING TESLA COIL.

(2145.) Cavet V. V. Turner, Arkansas, wants to know:

Q. 1.—Which is the most efficient for operating a Tesla coil—a two-inch spark coil or one of Thordarson's flexible transformers, or will the latter be too dangerous?

A. 1.—The latter will give the better results, and should not be dangerous if you keep away from the secondary circuit of the transformer while the Tesla coil is in operation.

Q. 2.—Can a rotary spark gap be run in connection with a Tesla coil with leyden jars?

A. 2.—Yes, it may be used in place of the ordinary spark gap with good results.

Q. 3.—Can leyden jars cause any harmful effects from discharging?

A. 3.—If you take the discharge from a large jar the shock will be very painful, or perhaps fatal.

OPERATOR'S PAY AND DUTIES.

(2146.) Chester Stephen, New Jersey, asks:

Q. 1.—The qualifications for assistant wireless operator and his duties?

A. 1.—The qualifications and duties are the same as for a regular operator. The pay depends on his ability and experience. See answer to No. 2143.

Q. 2.—Where could I apply for a position?

A. 2.—Write to the New York offices of any of the companies mentioned in No. 2143.

Q. 3.—What are the hours and pay of an assistant?

A. 3.—The hours are irregular. The assistant must be on duty whenever the regular operator is off. Each is supposed to be on duty twelve hours out of the twenty-four.

TESLA COIL. BRASS BALLS.

(2147.) Henry E. Johns, Wisconsin, inquires:

Q. 1.—Is a ½-inch spark coil large enough to operate a Tesla coil?

A. 1.—Yes, a very small one.

Q. 2.—Where can I obtain brass balls such as are used on leyden jars, etc.? I have several catalogues from electric supply houses, but none carries any in stock. If you positively know of a company where I can get them, please give me their address.

A. 2.—The Electro Importing Company, 233 Fulton street, New York City, carries them in stock in sizes up to one inch.

HUMMING IN PHONES. ALUMINUM WIRE.

(2148.) Roy F. Pitman, California, writes:

Q. 1.—There are high powered wires (about 60,000 volts) about 100 feet from my aerial. Does this cause the humming noise in my receivers?

A. 1.—In all probability, it does.

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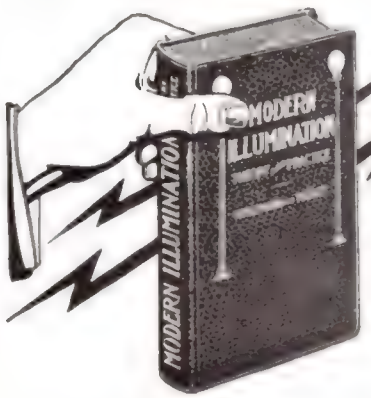

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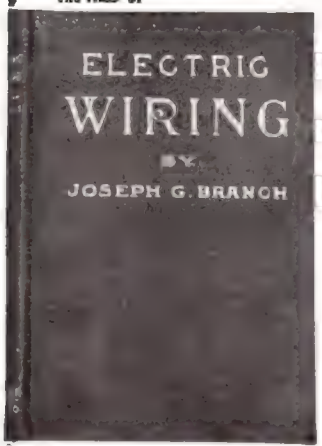

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Q. 2.—What code is mostly used by commercial operators near and in Los Angeles?

A. 2.—We don't know. Probably, if it is not now Continental, it shortly will be.

HELIX VS. OSCILLATION TRANSFORMER

(2149.) W. E. Daniell, Ontario, asks:

Q. 1.—Can I construct instruments involving the same principles as those that are patented for my own private use without being held liable?

A. 1.—Legally, no; but you do not run any great risk in so doing.

Q. 2.—Which gives the best results in transmitting, a helix or an oscillation transformer?

A. 2.—The latter.

STORAGE BATTERY.

(2150.) James Wood, New York, wants to know:

Q. 1.—How long should a storage battery which is rated at 20 ampere hours be charged?

A. 1.—You should not attempt to charge it in less than eight hours. This would require 2.5 amperes.

Q. 2.—If you charge it at 2 amperes for 10 hours, how long should you charge at 4 amperes?

A. 2.—Five hours, but you run the risk of ruining your battery.

HIGH VOLTAGE TRANSMISSION.

(2151.) Luther L. Tassier, Indiana, writes:

Q. 1.—In a certain hydro-electric plant in Michigan they step up 2,500 volts to 140,000 volts for the transmission line. Why do they do this?

A. 1.—This is done to save copper in the transmission line. Also, the cost of the supporting towers is less, while the insulators cost more. On the whole, the cost is much less, and as the transmission line is the largest item of cost in a power transmission project the saving is well worth while, for it reduces the total cost of the entire outfit. You probably know that a given amount of power can be transmitted with a small current if a high voltage is used—the higher the voltage, the smaller the current in direct proportion; also, that the smaller the current, the smaller the wires need be, hence, the high voltage.

Q. 2.—So far, have they ever transmitted electricity without wires? Do you think it will ever be done?

A. 2.—So far as we know, it has not yet been done commercially, but we haven't the slightest doubt that it will be done eventually.

Q. 3.—Where can I get books telling all about thermo-electricity from A to Z?

A. 3.—Write to the D. Van Nostrand Company, 25 Park Place, or the McGraw-Hill Book Company, 239 West 39th street, both of New York City.

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FAVATA AEROPLANE MOTOR.

(*Continued from page 612.*)

power to revolve the propeller and sustain the aeroplane aloft. Each motor part consists of two cylindrical bodies mounted side by side, and each in turn having an explosion chamber at both extremities. Thus, one unit consists of four cylinders operating two rods connecting with the common shaft. The motor weighs 350 pounds and delivers 180 horsepower with all cylinders in operation.

The outcome of the competitions between the Favata and the rotary Gnome engines are awaited with unusual interest, since the latter has been acknowledged the most efficient and widely used motor since its introduction in 1909 until the present time.

WITH THE INVENTOR.

(*Continued from page 632.*)

A^5. The receptacle B having the cover B^1 fits within the tube A and is provided at either end with the uprights B^2, rotatably and slidably mounted upon which is the square shaft B^3 carrying the toothed wheels B^4 slidably mounted thereon to support the cylindrical wick B^5 in a position substantially concentric with the tube A. The cover B^1 is provided with the U-shaped guards B^6 on either side of the wheels B^4 which prevent lateral displacement. The shaft B^3 is provided at its outer end with the handle C rigidly fixed thereon, by means of which the shaft B^3 and wheels B^4 may be rotated.

From this it will be seen that an efficient means has been provided to vaporize the contents of the receptacle, B.

We believe there will be some use for this invention, as there are many places where such a device would be used to good advantage.

ADVICE ON PATENTS.

(*Continued from page 634.*)

ly, and very quickly at that, as, if its flesh should be burnt, or even singed, other rats or mice would not come near the trap, which is a proven fact. The body of the rat, or mouse, or other rodent must be done away with in such a manner that the dead carcass cannot leave any odor behind. Thus, for instance, if the body were to drop into water underneath the trap it would be considered a successful apparatus.

This brings us face to face with the fact that if a trap is good enough to drown the rat in the first place the electrocution process becomes unnecessary, as the rodent certainly does not need to be killed twice in order to exterminate it.

For this reason we have little hesitancy in saying that there is really no such thing as an electric rodent exterminator, and we think most efforts along these lines are a

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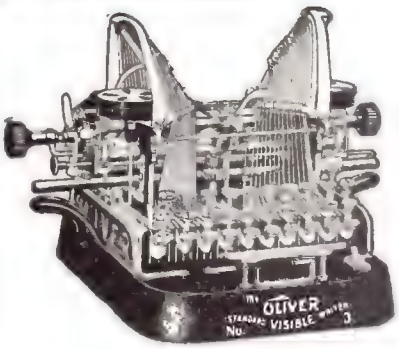

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A Big LITTLE thing—just what you've been wishing for. Flat. Compact. No loose parts. Three sizes of blades lock independently of each other in rigid steel handle, nickel-plated. Blades are perfectly tempered and guaranteed.

Marble's Pocket Screw Driver and Preat-o-lite Key ought to be in your pocket this minute.

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waste of time and energy. For this reason, also, we will not answer hereafter inquiries on rat traps unless some extraordinary idea should turn up, disproving our contention, which, by the way, we have good reasons to doubt.

NO MORE CRANKING OF AUTOMOBILES.

By Dr. Leonard Keene Hirshberg.

Every time the circumambient atmosphere is shattered by the cuss words of the chauffeur as he vainly cranks his machine, every time the flareback of the crank handle fractures a driver's wrist, devout prayers are offered to hasten the day of no more cranking.

At last that day is here. Every new model Cadillac, Pullman, Detroit, and several other machines, that is sold has a "straight front." That is, the handle for cranking is conspicuous by its absence. The driver of the machine need no longer leave his seat, profane his environment, or consult a surgeon. He "sits tight," and starts the car from his position of ease and comfort. Unaffected by mud, temperature, poor carburetor action or bad gasoline, the rotation starts by merely throwing in a new clutch, and continues long enough for any desired adjustment of throttle.

The system comprises a miniature and successfully adopted motor of fifteen pounds weight.

It uses from 200 to 300 watts to start most cars. The high speed of this motor—7,000 revolutions per minute—requires a gearing of a worm, worm-wheel, spur gear, and pinion with a ratio of 100 to 1. This gives the car about seventy turns a minute. A small two-pound flywheel is placed at the end of the motor shaft and its momentum, as it revolves rapidly, gives reserve energy to the motor.

The generator is a permanent magnet in combination with magnetic fields of a new design. It is mounted on ball bearings and insulated from all other systems.

THE SAME IN ALL TONGUES.

Brown: Isaacs, just as a matter of curiosity, how would you translate ten thousand dollars into Hebrew?

Isaacs: Mein frendt, dot expression vos very goot Hebrew choost as it is.

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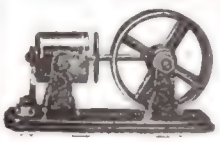

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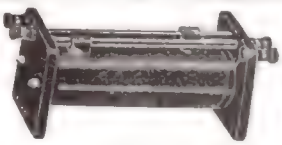

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Pony Telephone Receiver. This is the receiver you have long wanted. The best one on the market. Hard rubber case. Single pole, powerful magnet. Hook can be screwed off. Standard resistance of 75 ohms. Receiver sells for 40 cents. (Add 7 cents postage.)
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"Electro" Medical Coil. A1 quality. No end of fun with one of these coils, besides its therapeutic properties. Complete with cords and handles. Medical Coil sells for 70 cents. (Add 12 cents for postage.)
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"Electro" Amateur Phones, 2000 ohms resistance. Wound with No. 50 copper wire. Thin diaphragms. Leather covered adjustable headband. Weight 15 oz. 80 per cent. better than 75 ohm phones. Phones sell for $4.50. (Add 25 cents for postage.)
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Six Inch Geissler Tube With Liquid. A fine tube; works on any spark coil. Gives the most beautiful, astounding colors. Tube sells for 50 cents. (By mail extra ten cents.)
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Areo-Flying Machine. A practical miniature aeroplane; byplane type. Guaranteed to fly 100 feet. A well constructed machine. Aluminum propeller; rubber motor. Sells for 75 cents. (Add 12 cents for postage.)
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"Electro" Lytic Bare Point Detector. Holds the world's record for long distance receiving. Mounted on hard rubber base. Finest adjustment. Increase your receiving range 30 to 40 per cent. "Electro" Lytic Detector sells for $1.25 (Add 12 cents for postage.)
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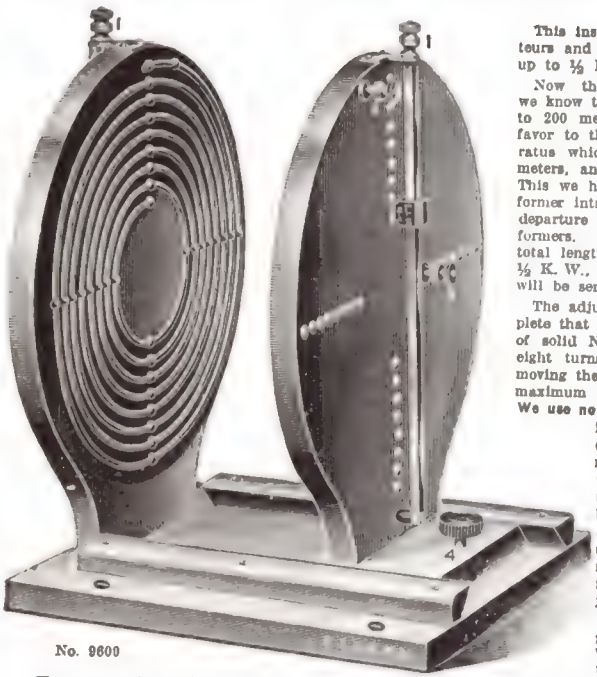
The "Electro" Commercial Oscillation Transformer



No. 9600

This instrument fills a long felt want among amateurs and has been designed to be used with power up to ½ K. W.

Now that the Wireless situation is clear and we know that the amateur may use a wave length up to 200 meters, we thought we could do no greater favor to the American amateur than build an apparatus which would confine the wave length to 200 meters, and at the same time obtain high efficiency. This we have accomplished in our Oscillation Transformer introduced herewith, and it presents a radical departure from other similar Oscillation Transformers. In connection with a four wire aerial, total length of fifty feet with any transformer up to ½ K. W., a wave length of not more than 200 meters will be sent out.

The adjustment of this apparatus is the most complete that could be thought of. There are two spirals of solid No. 6 Aluminum Wire, each spiral having eight turns. The two spirals can be separated by moving the spiral on the right back and forward, the maximum separation being 10 inches.

We use no helix clips of any kind, but the adjustment is made by means of a slider mounted directly on the back of each spiral. By means of these sliders, adjustments which vary the inductance to a half turn, are readily accomplished. This feature cannot but recommend itself and has never been attempted before in any other similar instrument. By means of the handle 4, the movable spiral can be adjusted back and forth, which assures practically any adjustment that may be wanted.

This apparatus is especially recommended for close tuning and is invaluable for Wireless Telephony work, where it positively stands unequalled.

The construction and general execution of the apparatus is of the highest order and stands distinctly by itself.

The wood is cherry throughout, mahogany finish, hand rubbed polish, ⅝ inch thick.

The Oscillation Transformer is shipped flat and takes up but little space when shipping.

The full size of the instrument is 16" x 14" x 12"; weight 8¾ lbs. All metal parts are brass nickel plated, except the Aluminum Wire.

There are six generous nickel binding posts. The Aluminum wire spirals are fastened by a unique process, never attempted before. The whole instrument will make a valuable addition to any wireless station.

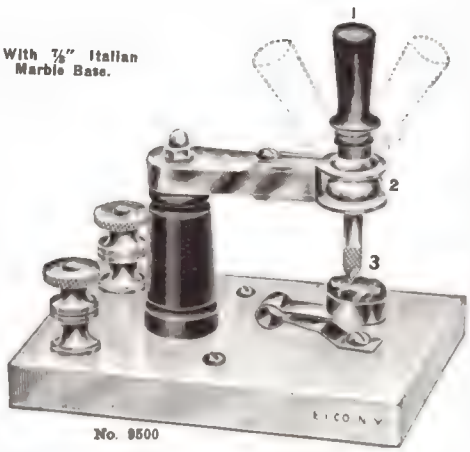
We positively guarantee the working efficiency and wave length of this instrument, and will cheerfully refund the purchase price if not entirely satisfactory and equal to our description.

No. 9600 ELECTRO COMMERCIAL OSCILLATION TRANSFORMER as described $10.00

CAN ONLY GO BY EXPRESS OR FREIGHT.

THE ELECTRO COMMERCIAL DETECTOR STAND

With 7⅛" Italian Marble Base.



No. 9500

Size over all 4½" x 3" x 5". Weight 1 lb.

This instrument lately perfected by us stands in a class all by itself. It is the highest grade Detector Stand ever introduced in the United States. It will appeal to all who wish a high grade instrument at a reasonable price.

Specification: Heavy marble base 7⅛" thick, size 4½ x 3". Hard Rubber Pillar, on which is supported a nickel plated casting, which holds the ball-swivel 2. As will be noted, the handle, 1, may be moved sideways in any direction on account of the swivel-ball arrangement; a feature not found in any other detector. This is quite an important feature, as it is often necessary with certain substances to "feel" over the surface in order to find the most sensitive spot.

The handle, 1, can also be pulled up vertically, as it is held back by a spring inside of the ball. Any amount of tension of the spring may be had by adjusting knurl, 3. This gives to the contact point on the detector substance any required tension. Therefore this detector is capable of the greatest variations, not alone in its free movement, but it can be adjusted from the lightest contact to the heaviest.

Only the best materials are used in the construction of this detector, all metal parts being finely nickel plated and highly polished.

There are two heavy nickel binding posts and there is a **FELT COVERING ON THE BOTTOM OF THE MARBLE BASE.**

No. 9500 ELECTRO COMMERCIAL DETECTOR STAND as described, price $3.75

BY MAIL EXTRA 25 CENTS.

"Electro" Ball Antenna Insulator

We are pleased to present to our friends herewith the latest addition to the "Electro" family.

We have had an urgent demand for a lower price Ball Antenna Insulator and the one we are presenting herewith solves the problem.

10007

The size of this Insulator over all is 3¼ x 2½ inches, weight 7½ ounces.

The Insulator is made entirely of porcelain in one piece and has a triple coating of brown glaze. The insulating value of this Insulator is of the highest order and greater than similar Insulators.

All the grooves are undershot and this feature is responsible for the fact that the new Insulator "sheds the water like a duck."

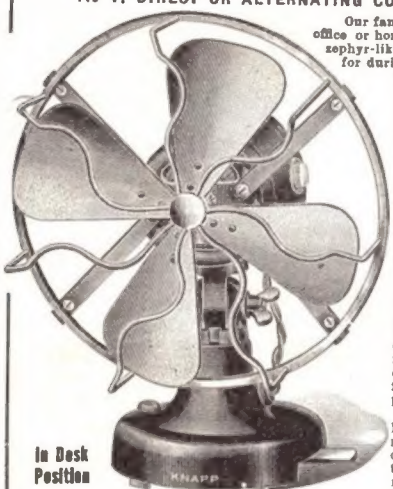
We guarantee that you will be pleased with this Insulator. It is the cheapest high-grade Insulator ever placed upon the American market and stands in a class by itself.

We recommend one Insulator on each end of an aerial strand for receiving. For sending there should always be two of the Insulators in tandem; this will afford sufficient insulation up to 1 K. W. transformer.

NO. 10007 "ELECTRO" BALL INSULATOR, AS DESCRIBED, EACH 16 CENTS; IN LOTS OF EIGHT (ENOUGH FOR A 4 WIRE AERIAL) $1.25

The "Electro" 8 Inch Fan

110 V. DIRECT OR ALTERNATING CURRENT.



In Desk Position

Our fans bring to your office or home the cooling zephyr-like breeze sought for during the humid months in the mountains or at the seashore. With 110 volt circuit available who would not spend one-quarter of a cent per hour to be comfortable during the excessive heat?

If your office is hot and stuffy, one of our "Electro" fans will change it immediately to a cool and comfortable temperature.

A hot, unhealthy bedroom is immediately converted into a dormitory where the cooling breeze from our "Electro" fan enchances the much needed sleep.

They are portable, adjustable, and easy to operate, circulating sufficient breeze to be refreshing but not objectionable, as is the case with larger types.

They are convertible and readily adjusted to the wall or desk; a special feature not found in the regular one position fan.

Motor finished in black enamel has wick feed oil cups and is fitted with a two speed starting switch. By adjusting the swivel and trunnion the breeze may be thrown in any direction. The guard is exceptionally strong and durable.

INTRODUCTORY PRICE $6.80

Storage Battery Plates

We have recently adopted new sized plates for our type R. E. and H. O. Storage Battery and have on hand a number of the old style plates formerly used. These plates are absolutely new and ready for use and we will dispose of them while they last at 50 per cent. below cost.

IF YOU EVER WANTED TO MAKE YOUR OWN STORAGE BATTERY, NOW IS THE TIME. TAKE ADVANTAGE OF THIS EXCEPTIONAL OPPORTUNITY BEFORE THESE PLATES ARE ALL GONE.

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M. E. 9-12

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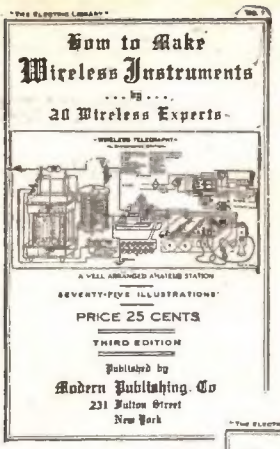

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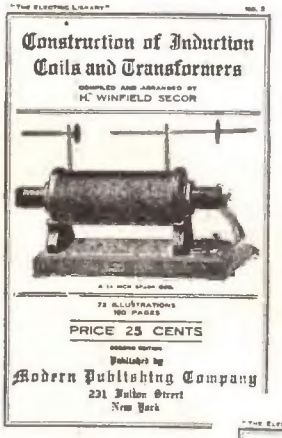

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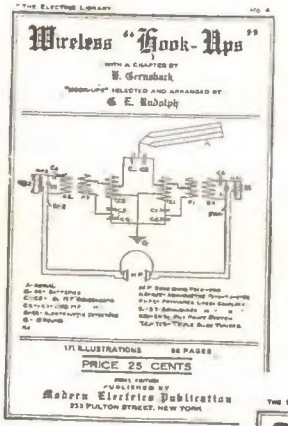

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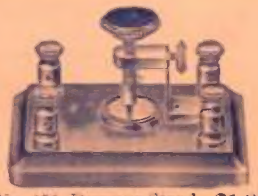

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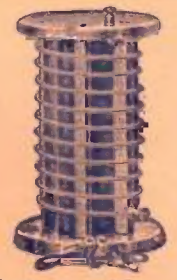

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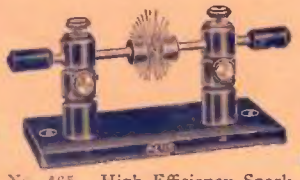

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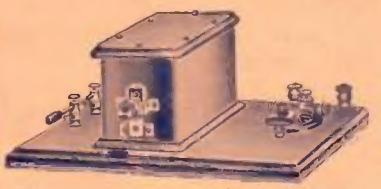

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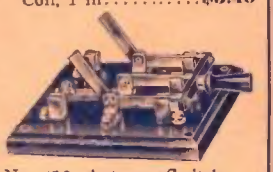

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